A PRELIMINARY ACCOUNT OF THE COLLEMBOLA-ARTHROPLEONA OF AUSTRALIA.

PART II.—SUPERFAMILY ENTOMOBRYOIDEA.

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[Read August 9, 1934.]

As with the Poduroidea, this superfamily of the Collembola has been little studied in Australia, doubtlessly because of its apparent lack of economic importance. That some species, at least, are potential pests will be seen from the few cases mentioned later.

The first record of this group from this country is that of *Isotoma troglodytica (Proisotoma minuta* Tullberg), described by Rainbow in 1907 (26). The remainder of the hitherto known forms were those recorded or described by Schött (28) from the Mjöberg material. In this collection were 33 species.

In the present paper, 78 species are recorded (3 as varieties only), of which 31 species are new, and no fewer than 27 are well-known forms, previously unknown from Australia. Three new genera are described.

Although even now the Collembolan fauna of Australia can be but partly known, especially in the northern parts, the numbers of species in the three main divisions are as follows:—

Symphypleona - - - -	47
Arthropleona-Poduroidea - -	33
„ Entomobryoidea -	91
	171

This total is only a little less than that of the species known for Europe.

Economic Importance of the Entomobryoidea.

Although the economic importance of the Collembola is as yet very little realized, except in one or two cases, the list of injurious species is gradually growing. In a recent publication Folsom (110A) has listed 43 species definitely injurious to crops. Of these, 16 belong to the group discussed in this paper, and 7 of them are now known to occur in Australia.

During the past few decades, there has been a tendency on the part of those who provide the money for research to ignore the pure collector and systematist and to concentrate only on the economic aspect. The fact that many species of Collembola present in Australia are either native of, or at least occur in, the more settled countries, should emphasise the importance and need for a thorough systematic and faunistic study of all insect orders. Hitherto, owing to the lack of this knowledge, much valuable time has been lost and money needlessly spent before the identity of a pest has been decided and its native country ascertained. Especially is this important in that field of entomological research known as Biological Control. Only in the native home of a pest can one hope to find controlling agencies, and many cases could be mentioned where, had a detailed faunistic knowledge been available, the obtaining of suitable parasites or predators would not have been such a blind and prolonged procedure.

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The "Lucerne Flea," although known to occur in Australia since 1884, was not definitely determined as the *Sminthurus viridis* of Europe until recent years. Its predatory enemy, *Biscirus lapidarius,* a European species, was found to be a controlling agent first in Western Australia. The group of mites (Bdellidae) to which it belongs has only recently been systematically surveyed in Europe, and not at all in England. The knowledge derived from a proper regional survey of this group of mites in those countries would have enabled the economic entomologist to consider the use of this mite as soon as the necessity of a control of a biological nature became apparent.

In Hawaii two outstanding examples may be mentioned. The native country of the Sugar-cane Leaf-hopper, *Perkinsiella saccharicida* was unknown for some years after it had become a pest. Subsequently, after a long and blind search, it was discovered in Queensland, where it was controlled by a number of small wasps. These parasites were then introduced with success into Hawaii. A knowledge of the Homoptera fauna of Australia would, therefore, have saved time and money. Similarly, search for the native home of the Sugar-cane borer beetle *Rhabdocnemis obscura,* was made in many parts of the world before it was finally located in Amboina along with its parasitic Tachinid flies. The protracted studies in Mexico of the insect enemies of the Prickly Pear by Prof. Johnston and his successors might have been available before the plant had reached the pest stage in Australia.

These few examples will serve to emphasise my contention that the systematic study of the insect fauna of all countries, while necessarily coincident with economic studies, is essentially fundamental to the work of the economic entomologist. The tendency to ignore the systematist must give way and a proper perspective taken of his work as it affects the practical control of insect pests.

Superfamily ENTOMOBRYOIDEA.

= Entomobryomorpha Börner, 1913.

Family ISOTOMIDAE (Schäffer, 1898; Börner, 1913).

Subfamily ISOTOMINAE (Schäffer, 1898; Börner, 1913).

Tribe ANUROPHORINI Börner, 1906.

Genus CRYPTOPYGUS Willem, 1902.

This genus is essentially a primitive one, which, except for a single species from New Zealand, was hitherto known only from the Subantarctic Regions. The species are very close and can only be separated by minute characters such as the number of ocelli, the form of the postantennal organ and the structure of the mucrones. Two species are now described from Australia, and a key given for all known forms.

Cryptopygus australis, n. sp. (Text fig. 1, *a-f.*)

Description.—Length 0·7 mm. Colour, light-brown, mottled, with well separated darker spots. Antennae very little longer than the head, segments I. : II. : III. : IV. = 10 : 11 : 11 : 21, IV. with small eversible apical lobe. Antennal organ III. as in figure 1 *b*. Ocelli, 8 on each side on deeply pigmented patches. Postantennal organ broadly oval, two and a half times as long as an anterior ocellus. Relative lengths of body segments in medio-dorsal line = th. II. : III. : abd. I. : II. : III. : IV. : V. = 35 : 25 : 25 : 25 : 25 : 16 : 15, abdomen VI. hidden under V. Claws simple, without inner teeth. Empodial appendage with inner and outer narrow lamellae. Tibiotarsus with two fine clavate hairs. Furca short, ratio of dens to mucro = 4 : 1, dens broad and thick, mucro apically tridentate. Clothing consisting of short fine setae.

Locality.—You Yang Mountains, Victoria, collected by Miss J. W. Raff.

Type in the South Australian Museum.

Cryptopygus loftyensis, n. sp. (Text fig. 1, *i.-m.*)

Description.—Colour, entirely blue. Antennae slightly longer than the head, ratio of segments = 17 : 25 : 23 : 37, IV. with small terminal exsertile knob, organ III. normal. Ocelli, 8 on each side, equal, on dark patches. Postantennal organ elliptical, equal to two ocelli. Ratio of body segments along medio-dorsal line = th. II. : III. : abd. I. : II. : III. : IV. : V. = 40 : 40 : 25 : 30 : 32 : 46 : 30; VI. hidden under V. Claws with inner tooth slightly beyond the middle. Empodial appendage with broad inner lamella. Tibiotarsus with two fine clavate hairs. Furca longer than in preceding species, ratio of manubrium : dens : mucro = 30 : 23 : 7, dens tapering, mucro with apical and subapical teeth and narrow inner lamella. Clothing of simple setae, uniform, more numerous than in preceding species.

Localities.—Syntypes in moss, Mount Osmond, South Australia, June 9, 1934 (H. W.); others in moss, Mount Barker, South Australia, June 24, 1934 (H. W.).

Syntypes in South Australian Museum.

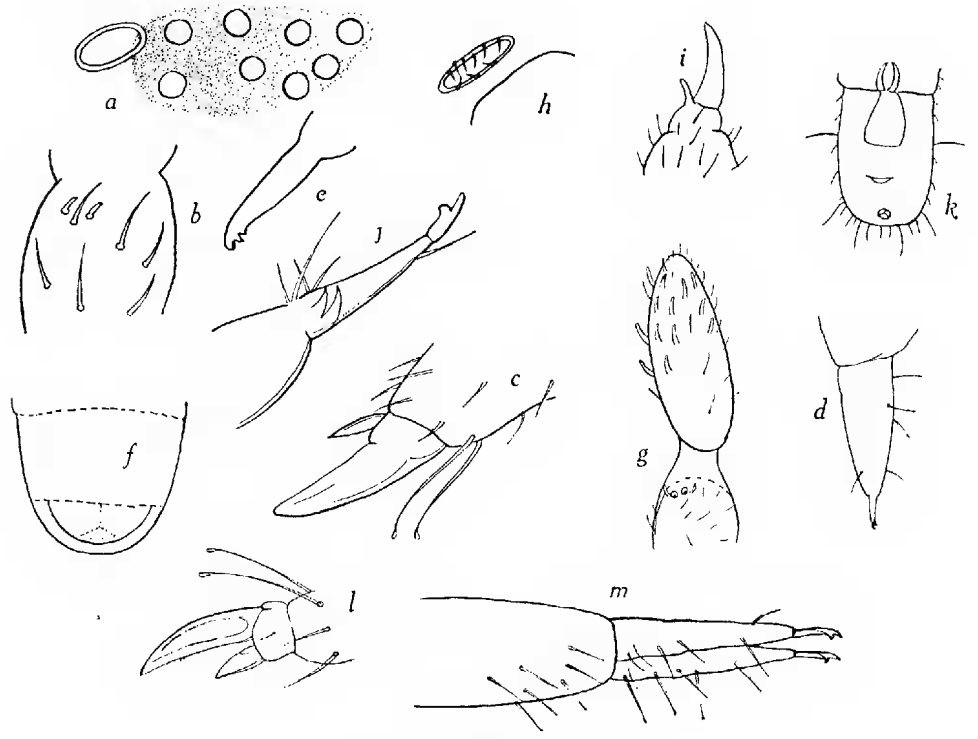

Fig. 1.

a.	*Cryptopygus australis*, n. sp.	Ocelli and postantennal organ.
b.	„ „ „ „	Sensory organ on ant. III.
c.	„ „ „ „	Tip of tibiotarsus.
d.	„ „ „ „	Furca from side.
e.	„ „ „ „	Mucro enlarged.
f.	„ „ „ „	Apical abdomen segments from below.
g.	*Isotomodes productus* (Axels.)	Tip. of ant. III. and whole of IV.
h.	„ „ „	Postantennal organ.
i.	„ „ „	Tip of tibiotarsus and claw.
j.	„ „ „	Furca.
k.	„ „ „	Apical abdom. segments from below.
l.	*Cryptopygus loftyensis*, n. sp.	Tip of tibiotarsus and claw.
m.	„ „ „ „	Furca.

KEY TO THE KNOWN SPECIES OF CRYPTOPYGUS WILLEM.

1.	Ocelli, fewer than 8 on each side. P.a.o. crescentic or elliptical.	3
	Ocelli, 8 on each side. P.a.o., oval.	2
2.	Mucro with three subapical teeth. P.a.o. three to four times as long as an anterior ocellus.	*C. australis*, n. sp.
	Mucro with subapical and apical teeth only.	*C. loftyensis*, n. sp.
	Mucro with only a blunt apical tooth.	*C. niger* Carp, 1925 (New Zealand).
3.	Ocelli absent. Mucro tridentate, distal tooth about the middle. Tibio-tarsus without clavate hairs. Colour, white.	*C. coecus* Wahlgren, 1906 (Subantarctic).
	Ocelli, 6 or 7 on each side.	4
4.	Ocelli, 7 on each side. P.a.o., crescentic. Clavate tibiotarsal hairs present. Mucro, bidentate. Colour, blackish.	*C. antarcticus* Willem, 1902 (Subantarctic).
	Ocelli, 6 on each side.	5
5.	Clavate tibiotarsal hairs absent. Colour, mottled bluish-black.	*C. cinctus* Wahlgren, 1906 (Subantarctic).
	Clavate tibiotarsal hairs present. Colour, bluish-violet.	*C. crassus* Carp., 1905-6 (South Orkneys).

Genus ISOTOMODES (Axels.) Linnaniemi, 1907.

Syn. *Isotoma* Axels. 1903 (ad partem).

ISOTOMODES PRODUCTUS (Axels., 1907). (Text fig. 1, *g.-k.*)

= *Isotomo elongata* Axels., 1903 (nec. McGillivray, 1896); *Isotoma producta* Axels., 1906; *Isotomodes productus* Axels., 1907.

Description.—Length, to 1·0 mm. White. Antennae short, about one-fourth as long as the head. Body elongate, ratio of abdominal segments = 4 : 6 : 5 : 6 : 6 : 4. Antennae IV. with subapical papilla and 6 olfactory hairs. P.a.o. large, broadly elliptical and not notched. Ocelli absent. Furca short, not reaching abd. II. Dentes not annulated, with 2 dorsal and 2 ventral setae. Mucro one-fourth the length of dens and with two strong teeth. Clothing short and sparse, simple.

Localities.—Under deeply embedded stones at Chittering, Western Australia, October 10, 1931 (H. W.); similarly on Mount Osmond, South Australia, in 1933 (H. W.).

Remarks.—This is a well-known but rare European species, and may possibly be considered as an introduction to Australia by means of plant soil.

Genus FOLSOMIA Willem, 1902.

Syn. *Isotoma* Tullberg, 1897 (ad partem).

FOLSOMIA FIMETARIA (Linn., 1758), Tullbg., 1872. (Text fig. 2, *a.*)

= *Podura fimetaria* Linn., 1758; *Isotoma alba* Tullbg., 1871; *Folsomia candida* Willem, 1902; *Isotoma splendens* Becker, 1902.

Description.—Length, 1·0-1·5 mm. Colourless and blind. Clothing of short, thick hairs. Antennae slightly longer than the head. Antennae IV. with subapical papilla and olfactory hairs. Antennal organ III. with 2 curved sensory rods and 2 guard setae. P.a.o. long and narrow with parallel edges, not curved. Claws unarmed, seldom with inner tooth. Empodial appendage lanceolate.

Clavate tibiotarsal hairs absent. Mucro as long as hind claw, with two teeth, one distal and one apical.

Locality.—Riddell, Victoria, on March 14, 1931 (H. G. A. and H. F. D.).

Remarks.—Probably an introduction from Europe, where it is a common species under loose boards, stones or in soil. It is also recorded from the Nearctic Region, and will probably be found to be widely distributed in cultivated parts of Australia.

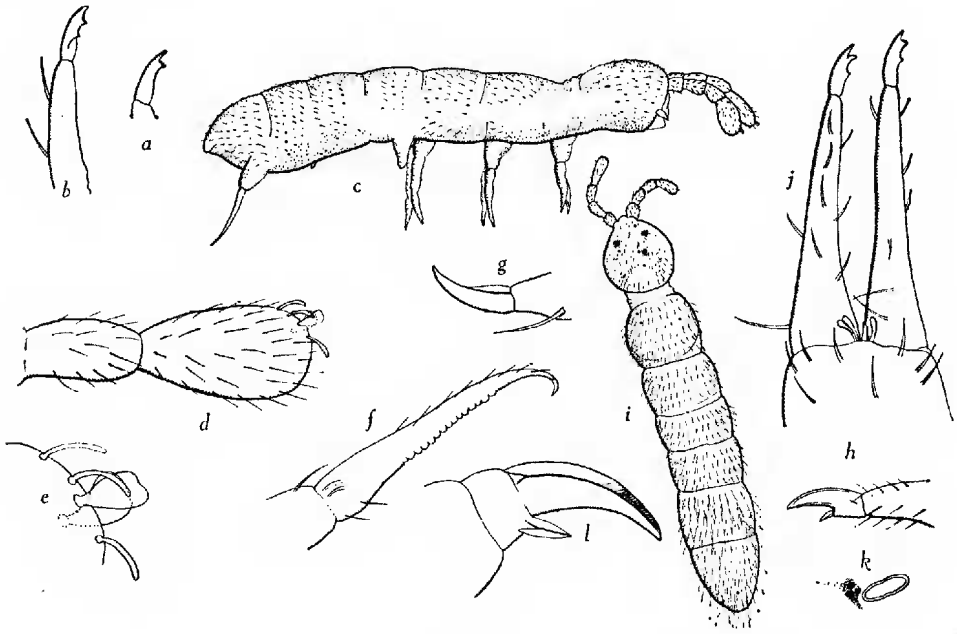

Fig. 2.

a.	*Folsomia fimetaria* (Linn.)	Mucro, side view.
b.	„ *fimetarioides* (Axels.)	Tip of dens and mucro.
c.	*Folsomina onychiurina* Denis	Entire animal.
d.	„ „ „	Ant. III. and IV.
e.	„ „ „	Sensory organ on ant. IV.
f.	„ „ „	Dens and mucro.
g.	„ „ „	Mucro.
h.	„ „ „	Tip of tibiotarsus and claw.
i.	*Folsomia loftyensis,* n. sp.	Entire animal, dorsal view.
j.	„ „ „ „	Furca.
k.	„ „ „ „	Ocelli and p.a.o.
l.	„ „ „ „	Foot.

FOLSOMIA FIMETAROIDES (Axels., 1903). (Text fig. 2, *b.*)

= *Isotoma fimetaroides* Axels., 1903.

Description.—Length, 1·8 mm. White and blind. Antennae as long as head, IV. with 10 olfactory hairs, subapical papilla and terminal knob. P.a.o. narrow and doubly contoured. Claws unarmed. No clavate tibiotarsal hairs. Abd. IV.-VI. fused. Furca not quite reaching ventral tube. Dens twice as long as manubrium, distally curved and annulated. Mucro with three teeth.

Localities.—Sherbrook, Victoria, April 19, 1931 (H. G. A. and H. F. D.); September, 1931 (H. F. D.); Sassafras, Victoria, December, 1931 (H. G. A.).

Remarks.—This species differs little from the preceding except in the dentition of the mucro. It is also possibly an introduction from Europe, where it has been recorded from Finland, Switzerland, and England.

Folsomia loftyensis, n. sp. (Text fig. 2, *i.-l.*)

Description.—Length to 1·5 mm. Colour, whitish-grey, with slight patches of dark pigment on head and laterally on body. Ocelli, 3 on each side close together in a triangle, deeply pigmented on small dark patches. Post-antennal organ large, quite three times as long as the whole ocellar patch, doubly contoured and notched on each side. Antennae slightly longer than head, ratio of segments = 12 : 18 : 18 : 32, IV. with terminal knob, antennal organ III. indeterminate. Thorax II. and III. subequal. Abdomen IV. slightly longer dorsally than III. Claws simple, unarmed. Empodial appendage with inner and outer lamellae. Furca short, not reaching abd. II.; ratio of dens to mucro = $5\frac{1}{2}$: 1; mucro tridentate (*cf.* fig.); dentes ventrally with spines. Abdomen IV.-VI. fused. Anus slightly ventral. Clothing of long fine setae.

Locality.—Long Gully, Mount Lofty Ranges, South Australia, May, 1934 (H. W.).

Syntypes in the South Australian Museum.

Remarks.—Differs from *Folsomia sexoculata* Tullbg. in the arrangement of ocelli and the tridentate mucro.

Genus Folsomina Denis, 1932.

This very interesting genus is closely allied to *Folsomia* Willem, but differs in the falciform mucro, the absence of a postantennal organ and in the complicated structure of the subapical sensory organ on the fourth antennal segment.

Folsomina onychurina Denis, 1932. (Text fig. 2, *c.-h.*)

Description.—Length, 0·6-0·7 mm. Colour, white. Ocelli and p.a.o. wanting. Antennae slightly longer than the head, ratio of lengths of antennal segments = 8 : 10 : 12 : 20, IV. twice as broad as III., subapically with a complex sensory organ consisting of two large scale-like lobes, behind which are two strongly curved olfactory hairs and in front another one. Antennal organ III. consisting of two rods or tubercles flanked by two olfactory hairs. Claws unarmed, five times as long as mucro. Empodial appendage distinct with narrow outer and broader inner lamella. Clavate tibiotarsal hairs absent. Furca rather short, ratio of manubrium to mucrodens = 17·5 : 30, dens tapering and annulated, mucro falciform with a slight inner basal lamella. Clothing of short, sparse, simple setae.

Localities.—Nangara, Western Australia, November 11, 1930 (B. A. O'C.); in hothouse, Government Gardens, Perth, Western Australia, February 10, 1930 (B. A. O'C.).

Remarks.—This genus and species was only described in 1932 from two specimens collected in Costa Rica in 1911. Its occurrence in Australia is remarkable, and while its capture in a hothouse may point to its being an introduction, the Nangara locality may be a perfectly natural one. No details of the habitat in which it occurred in Costa Rica are given.

Genus AXELSONIA Börner, 1907.

Syn. *Isotoma* Moniez, 1890 (ad partem).

AXELSONIA LITTORALIS (Moniez, 1890). (Text fig. 3, *a.-e.*)

= *Isotoma littoralis* Moniez, 1890; *Isotoma nitida* Folsom, 1899; *Axelsonia thalassophila* Börner, 1906; *Axelsonia littoralis* Denis, 1924.

This is a typical shore-inhabiting form and lives on decaying molluscs and barnacles. It is to be found in numbers in the crevices of rocks lying between high and low water, and can withstand immersion to a considerable depth. Previously it has been recorded from France, Japan and the Seychelles. The genus, which is monotypic, is separated from the other genera of the Isotominae on the following characters: abdomen II.-IV. with 2 pairs of fine sensory setae (Bothriotrichiae). P.a.o. absent. Clavate tibiotarsal hairs absent. Claw on outside with two long lancet-like processes. Antennae III. with 15-20 sensory rods. Colour, greyish-green.

In Australia this species has been found in the following localities:—Longreach Bay, Rottnest Island, Western Australia, January, 1931 (L. J. G.); Point Perron, Western Australia, April 6, 1931 (H. W.); King River Estuary, Western Australia, January, 1932 (H. W.).

Genus **Acanthomurus,** n. gen.

Allied to *Isotomurus,* but differing in that the dentes are armed ventrally with numerous slightly curved setae which are strongly serrated on one side. The body setae are strongly ciliated and not simple.

Genotype = *Acanthomurus plumbeus,* n. sp.

Acanthomurus plumbeus, n. sp. (Text fig. 3, *f.-j.*)

Description.—Length, 2·7 mm. Colour, blue-black, except anterior margins of segments, which are yellowish. Antennae and legs, except trochanters and base of femora, blue-black. Furca, yellowish with a tinge of blue at base of manubrium. Antennae nearly three times as long as head; ratio of segments = 1 : 4 : 4 : $4\frac{1}{4}$. Ocelli, 6 on each side on dark patches. P.a.o. small, elliptical, less than half an ocellus in diameter. Antennal organ III. as in figure 3, *g.* Legs long; claws with two inner teeth, one slightly beyond the middle, the other more distal, and a basal lateral tooth. Empodial appendage long, reaching past the first tooth of the claw, with broad outer lamella reaching the tip and slightly narrower lamella on inside for one-third of its length; the latter lamella with a very prominent inner tooth. Clavate tibiotarsal hairs absent. Furca reaching ventral tube; ratio of manubrium to mucrodens = 1 : $2\frac{1}{2}$, mucro less than one-fourth the length of hind claw and with four teeth. Dentes indistinctly fringed with numerous long hairs and on ventral side with short and strong, evenly curved, setae, which are serrated on one side. Length of body segments, th. II. : III. : abd. I. : II. : III. : IV. : V. : VI. = $2\frac{1}{2}$: 2 : $1\frac{1}{2}$: 2 : $2\frac{3}{4}$: $2\frac{1}{2}$: $1\frac{1}{2}$: 1. Segments of body heavily clothed with long ciliated setae. Abdomen IV. and VI.? with sensory setae (Bothriotrichiae), as well as several equally long but stouter ciliated setae. Tibiotarsi with long setae.

Localities.—Under rotten bark at Parkerville, Darling Ranges, Western Australia, October 5, 1930 (H. W.); Mount Barker, Western Australia, June, 1931 (H. G. A.); Gooseberry Hill, Western Australia, June, 1932 (G. E. N.).

Syntypes in the South Australian Museum.

Var. **lineatus,** n. var.

Differs from the typical form in the lighter ground colour and the four longitudinal dark lines on the dorsum. Specimens were received from Launceston, Tasmania, collected by Mr. V. V. Hickman in August, 1929.

Type in the South Australian Museum.

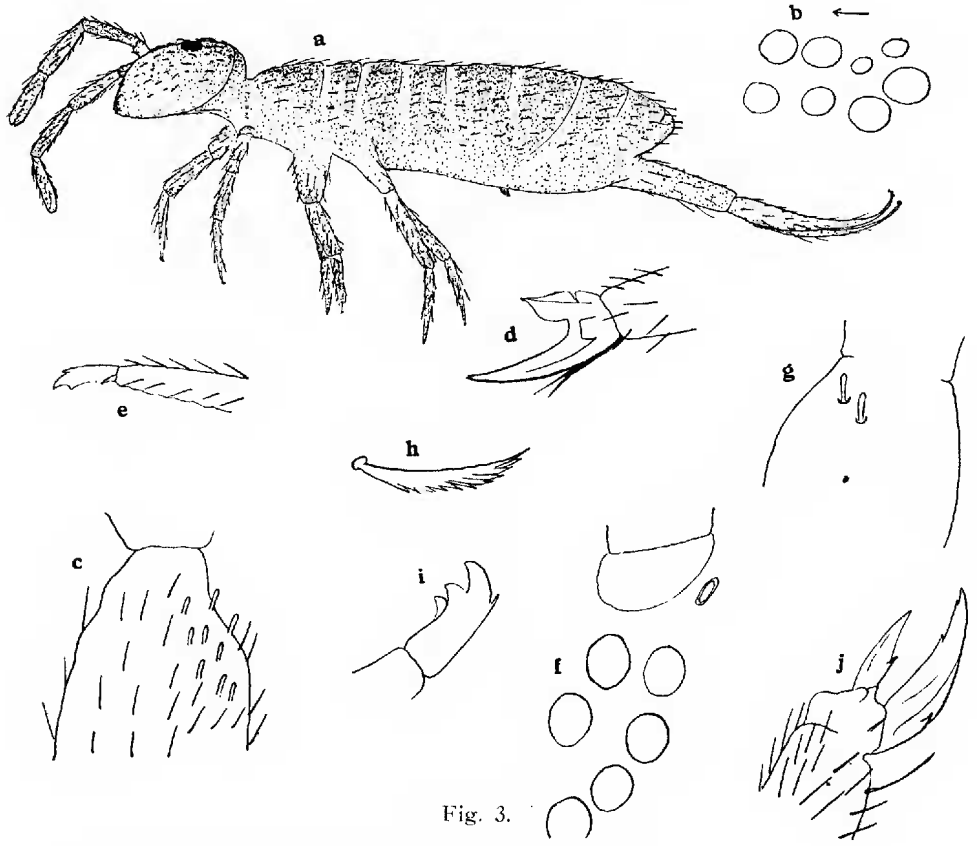

Fig. 3.

a.	*Axelsonia littoralis* (Monz.)	Entire animal.
b.	„ „ „	Ocelli.
c.	„ „ „	Tip of ant. III.
d.	„ „ „	Tip of tibiotarsus and claw.
e.	„ „ „	Mucro and tip of dens.
f.	*Acanthomurus plumbeus,* n. g., n. sp.	Ocelli and postantennal organ.
g.	„ „ „ „	Sensory organ on ant. III.
h.	„ „ „ „	Curved seta from ventral surface of dens.
i.	„ „ „ „	Mucro.
j.	„ „ „ „	Tip of tibiotarsus and claw.

Genus **Proisotomurus,** n. gen.

Allied to *Isotomurus* and *Acanthomurus* but having the dentes armed ventrally with a double row of strong, simple spines arising from very distinct papillae. These papillae would appear to connect the genus with *Agrenia* Börner. Fine sensory setae (Bothriotrichiae) are present on at least abdomen II. and III., but these are only about half as long as in the genera *Isotomurus* and *Acanthomurus.*

Genotype = *Proisotomurus papillatus,* n. sp.

Proisotomurus papillatus, n. sp. (Text fig. 4, *a-e.*)

Description.—Length, 2·6 mm. Colour as in *Isotomurus palustris* Mull., *f.p.* Antennae nearly $2\frac{1}{2}$ times the length of head, segments = $1\frac{1}{4}$: 2 : 2 : $2\frac{1}{6}$. Antennal organ III. as in fig. 4 *a*. Ocelli, 8 on each side. P.a.o. small, elliptical about half an ocellus in diameter. Ratio of lengths of body segments = th. II. : III. : abd. I : II. : III. : IV. : V. : VI. = 1 : 1 : $\frac{2}{3}$: $\frac{3}{4}$: 1 : 1 : $\frac{1}{2}$: $\frac{1}{2}$. Claws with basal lateral tooth but no inner teeth. Empodial appendage reaching to half the length of claw, pointed, with broad inner and narrower outer lamella, inner angle with small tooth. Clavate tibiotarsal hairs absent. Furca reaching beyond ventral tube; ratio of manubrium to mucrodens = $2\frac{1}{2}$: $4\frac{1}{2}$. Dentes with moderately long setae and ventrally with two rows of papillae, each armed with a long, strong spine. Mucro with four teeth. Clothing of numerous long, simple setae, although several longer setae on the middle and hind legs are ciliated. Abdomen II.-IV with fine but relatively short sensory setae.

Locality.—Guildford, Western Australia, October 6, 1930 (H. W.).

Syntypes in the South Australian Museum.

Genus Isotomurus Börner, 1903.

Syn. *Podura* Müller 1776 (ad partem); *Isotoma* Bourlet, 1839 (ad partem).

Isotomurus palustris (Müller, 1776). (Text fig. 4, *f-g.*)

= *Podura palustris* Müller, 1776; *Isotoma palustris* Tullberg, 1872; Lubbock, 1873; Reuter, 1876 (ad partem); Reuter, 1880. *Isotoma aquatilis* Lubbock, 1873 (ad partem). *Isotoma stuxbergi* Tullberg, 1876; Moniez, 1891; Jacobson, 1898. *Isotomurus palustris* Börner, 1903. *Isotoma tricolor* Packard, 1873. *Isotoma aequalis* MacGillivray, 1902.

Description.—Length, to 3·0 mm. Thickly haired, but all hairs are simple except a few longer ones on segments V. and VI which are ciliated. Bothriotrichiae on abd. II.-IV. Colour very variable, from uniform yellowish-green to blackish, the lighter forms sometimes with longitudinal lines. Ocelli, 8 on each side. P.a.o. elliptical, as wide as two ocelli. Antennae half as long again as head. Claws long, without inner teeth. Empodial appendage lanceolate with lateral teeth and basally rounded inner lamella. Clavate tibiotarsal hairs absent. Dens twice as long as manubrium. Mucro with four teeth.

This cosmopolitan species is common everywhere on cultivated ground in the southern part of Western Australia, and also in South Australia Specimens have also been sent from Stanley, Tasmania, collected in 1930.

Var. Balteata (Reuter, 1876).

= *Isotoma balteata* Reuter, 1876; *Isotoma palustris* var. *balteata* Schött, 1893, Reuter, 1895.

This variety has the anterior three-fourths of the abdominal segments dorsally of a bluish colour. It occurred rather abundantly in the hot-house of Government Gardens, Perth, Western Australia, on February 11, 1932. I have also seen specimens collected by Mr. A. R. Brimblecombe in a glass-house at Brisbane, Queensland, May 16, 1932.

Isotomurus chiltoni (Carp., 1925). (Text fig. 4, *i.-m.*)

= *Isotoma chiltoni* Carp., 1925.

This species was described by Dr. Carpenter from a single, somewhat abraded specimen from New Zealand. Owing to the poor condition of the specimen the original description is lacking in many important details. I have received many

specimens from various parts of Australia which appear to be co-specific with Carpenter's species, and I am able to give a somewhat fuller description. Dr. Carpenter's surmise that the body hairs when present might be ciliated is confirmed. No mention was made in the original description of the postantennal organ, but in many of my specimens this was observed to be present although comparatively small and only seen with difficulty. Similarly, no sensory setae were observed originally on the New Zealand specimen, and they were therefore presumed to be absent. In most of my specimens these setae were distinctly present. The presence of the latter places the species in *Isotomurus* and not *Isotoma.*

Fig. 4.

a.	*Proisotomurus papillatus,* n. g., n. sp.	Tip of ant. III.
b.	„ „ „ „	Anterior ocellus and postantennal organ.
c.	„ „ „ „	Claw and tip of tibiotarsus.
d.	„ „ „ „	Mucro and tip of dens.
e.	„ „ „ „	Abdominal sensory hair.
f.	*Isotomurus palustris* (Müll.)	Claw and tip of tibiotarsus.
g.	„ „ „	Mucro and tip of dens.
h.	*Isotoma tridentifera* v. *edenticulata,* n. v.	Claw and tip of tibiotarsus.
i.	*Isotomurus chiltoni* (Carp.)	Antennae.
j.	„ „ „	Anterior ocelli and postantennal organ.
k.	„ „ „	Claw and tip of tibiotarsus.
l.	„ „ „	Mucro and tip of dens.
m.	„ „ „	Dorsal body hairs.
n.	*Isotomurus echnidus,* n. sp.	Antennae II. showing specialized setae of male.
o.	„ „ „	Specialized setae of ant. II. of male.
p.	„ „ „	Claws and empodial appendage of leg III.
q.	„ „ „	Claws and empodial appendage of leg I.
r.	„ „ „	Mucro.

Amended Description.—Size, to 3·0 mm. Colour, variable, from yellowish with dark purple marking to almost completely bluish. Antennae twice as long as head, ratio of segments approximately 15 : 20 : 20 : 30. Ocelli, 8 on each side on dark patches, inner hinder pair of ocelli smaller than the others. P.a.o. present, small, elliptical, half as long as an anterior ocellus. Claws with prominent dorsolateral teeth and two fine inner teeth (one, in Carpenter's specimen).

Empodial appendage elongate with narrow outer lamella and broader basal inner lamella with an acute spine at the angle. Mucro with small ventral tooth and prominent apical tooth, as well as two dorsal teeth. Clothing of comparativcly long and numerous, strongly ciliatcd setae, which are longer and stouter on the anal segments and on the head. In addition, sensory setae are present on abdomen II.-IV.

Localitics.—Crawley, Western Australia, June 3, 1931 (D. C. S.); National Park, Western Australia, September 3, 1931 (D. C. S.); Sherbrook, Victoria, April 19, 1931 (H. F. D. and H. G. A.); Pinjarra, Western Australia, September 29, 1931 (D. C. S.); Adelaide, South Australia, April 7, 1932 (D. C. S.); Goose-bcrry Hill, Western Australia, June 6, 1932 (G. E. N.); Armadale, Western Australia, June, 1932 (G. E. N.); Albany, Western Australia, July 7, 1932 (II. W.); Porongorups, Western Australia, September 30, 1932 (H. W.).

Isotomurus echidnus, n. sp. (Text fig. 4, *n-r*.)

Description.—Length, 3·2 mm. Colour, bluish with dark posterior edges to the segments and a slight dorsal streak. Antennae bluish, II.-IV. lighter except apex of IV. Legs and manubrium bluish. Ocelli, 8 on each side, equal. P.a.o. present, half an ocellus in diameter, clliptical. Antennae two and a half times as long as the hcad, ratio of segments = 15 : 20 : 20 : 30, clothed with numerous short ciliated hairs hetween which are similar but simple spines. Claws approxi-mately three times as long as mucro, with three very fine distal teeth inside. Empodial appendage about one-half the length of claw, with fine outer distal tooth on leg III.; shorter and without tooth on leg I. Clavate tibiotarsal hairs absent. Furca strong, reaching ventral tube, ratio of manubrium to mucrodens = 35 : 42, mucro with only two teeth. Clothing of numerous very short, curved, ciliated setae; around the neck, on head and dorsally on segments with many long stout parallel-sided, rather hlunt ciliated setae. On the middlc of ahdomen III. in good specimens is a beard-like cluster of curved ciliated setae of intermediate length. Sensory setae are present at least on abdomen II.-IV. Ratio of th. II. : III. : abd. I. : II. : III. : IV. : V. : VI. = 25 : 15 : 10 : 20 : 20 : 35 : 10 : 5. The male sex is remarkable for the presence, on the apical inner side of segment II. of the antennae, of a cluster of short strong and, in certain aspects, apically broadened and ciliated setae or spines.

Localities.—Holotype female and one other from Trevallyn, Tasmania, August 17, 1929 (V. V. H.); allotype male from Bridgewater, South Australia, June 6, 1932 (D. C. S.); Glen Osmond, South Australia, May 14, 1933 (H. W.); in numbers in moss, Waterfall Gully, South Australia, September, 1933 (H. W.).

KEY TO THE AUSTRALIAN SPECIES OF ISOTOMURUS.

1. Mucro with four teeth. 2
   Mucro with only two teeth. Some of the body setae large, parallel-sided and ciliated. Male with specialized setae on antennae II. *I. echidnus*, n. sp.
2. Most of the body setae simple, only a few ciliated ones on anal segments. P.a.o. large. *I. palustris* (Müller).
   All body setae ciliated, the larger ones always pointed apically. P.a.o., small. *I. chiltoni* (Carp.).

Genus PROISOTOMA Börner, 1906.

Syn.—*Isotoma* Tullberg, 1871 (ad partem).
Proisotoma Börner, 1901 (ad partem) (as subgcnus).
Subgenus ISOTOMINA Börner, 1903.

PROISOTOMA (ISOTOMINA) THERMOPHILA (Axels., 1907). (Text fig. 5, *a.e.*)

Description.—Length, 1·0 mm. Of general *Isotoma* facies, but abdomen IV. longer than III. Colour, greyish. All setae simple, rather longer on anal segments. Antennae indistinctly longer than the head, IV. without olfactory setae. P.a.o. elliptical, notched medially on each side, equal in length to 2-3 ocelli. Ocelli, 8 on each side, equal. Tarsi without clavate hairs. Abdomen V. and VI. fused. Furca scarcely reaching middle of abdomen II. Mucro with two teeth.

Numerous specimens which can be referred to this European species have been collected from the following localities:—Crawley, Western Australia, June 3, 1931 (D. C. S.); Gooseberry Hill, Western Australia, June 6, 1932 (G. E. N.); Bridgetown, Western Australia, June 16, 1932 (H. G. A.); Reedbeds, South Australia, May 4, 1933 (H. W.).

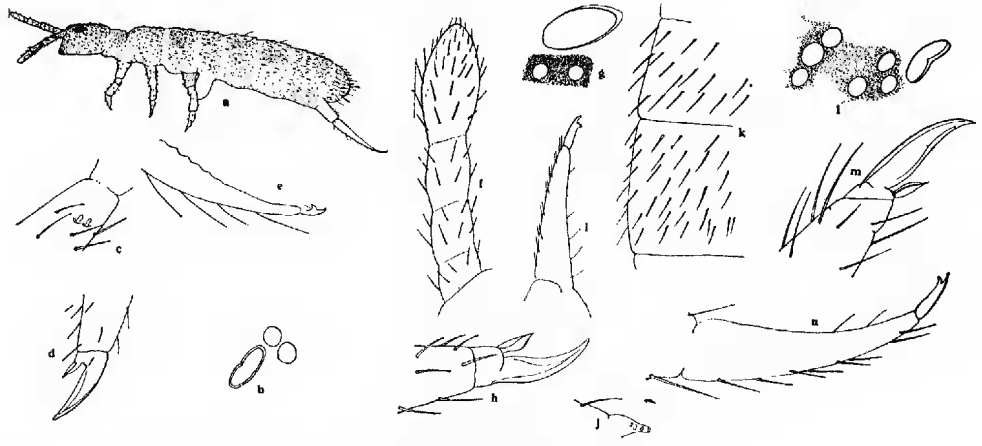

Fig. 5.

a.	*Proisotoma (Isotomina) thermophila* (Axcls.)	Entire animal.
b.	„ „ „ „	Anterior ocelli and postantennal organ.
c.	„ „ „ „	Tip of ant. III.
d.	„ „ „ „	Claw and empodial appendage.
e.	„ „ „ „	Mucro and tip of dens.
f.	*Proisotoma ripicola* Linnan.	Antennae.
g.	„ „ „	Anterior ocelli and postantennal organ.
h.	„ „ „	Claw and tip of tibiotarsus.
i.	„ „ „	Mucro and dens.
j.	„ „ „	Rami of tenaculum.
k.	„ „ „	Dorsal body setae.
l.	*Proisotoma (Isotomina) sexoculata*, n. sp.	Ocelli and postantennal organ.
m.	„ „ „ „	Claw and tip of tibiotarsus.
n.	„ „ „ „	Mucro and dens.

Proisotoma (Isotomina) sexoculata, n. sp. (Text fig. 5, *l.-n.*)

Description.—Length, 1·0 mm. Colour, uniformly bluish. Antennae one-third longer than the head, ratio of segments = 10 : 15 : 15 : 25, antennal organ III. normal. P.a.o. two and a half times as long as an anterior ocellus. Ocelli, 6 on each side in two groups of three and on two patches of pigment which join, posterior group of ocelli unequal. Ratio of length of abdomen III. : IV. = 30 : 35, abdomen V. and VI fused. Claw with fine inner tooth. Tibiotarsus with two long indistinctively clavate hairs. Furca short and only just reaching abdomen II., ratio of manubrium : dens : mucro = 15 : 15 : 5; dens with 8 ventral and 2 subapical dorsal setae.

Localities.—Crawley, Western Australia, April, 1931 (D. C. S.); Sherbrook, Victoria, April, 1931 (H. F. D. & H. G. A.); ditto September, 1931 (H. F. D.); Sassafras, Victoria, December, 1931 (H. G. A.).

Syntypes in the South Australian Museum.

Remarks.—This species is closely related to *P. (I.) hirsuta* Denis from Costa Rica, but has a mucro very much smaller as compared with the dens.

Proisotoma (Isotomina) pilosa, n. sp. (Text fig. 6, *h.-j.*)

Description.—Length, 1·4 mm. Colour, bluish, darker on ocellar patches. Antennae barely longer than the head, ratio of segments = 1 : $1\frac{1}{2}$: $1\frac{1}{2}$: $2\frac{1}{4}$, IV. with terminal knob and ? one or two olfactory hairs, antennal organ III. as far as can be seen of normal structure. Ocelli, 6 on each side on a single patch of pigment. P.a.o. elliptical, equal to one anterior ocellus in diameter. Claws unarmed. Empodial appendage lanceolate. Clavate tibiotarsal hairs absent. Furca short, only reaching posterior edge of abdomen II. Mucrodens subequal to manubrium, mucro with two teeth, half the length of dens, dens with 3 ventral setae, the basal one longer than the others, and three short setae apically and dorsally, dentes not annulated. Manubrium ventrally with 7-8 setae. Rami with 4 barbs and basal seta. Abdomen III. : IV. = 4 : $4\frac{1}{2}$, V. and VI. fused. Clothing of strong setae much as in *P. (I.) hirsuta* Denis; some longer on anal segments.

Locality.—In moss from Waterfall Gully, Mount Lofty Ranges, South Australia, May 6, 1933 (H. W.).

Syntypes in the South Australian Museum.

Remarks.—Like the preceding, this species is very close to *P. (I.) hirsuta* Den. from Costa Rica, but differs in the complete absence of clavate tibiotarsal hairs, the length of the p.a.o., the shape of the empodial appendage, the dental setae and the relative lengths of the mucro and dens.

Subgenus Proisotoma s. str. Börner, 1906.

Proisotoma ripicola Linnaniemi, 1912. (Text fig. 5, *f.-k.*)

= ?*Isotoma agilis* Schtscherbakow, 1899; Axelson, 1905. *Proisotoma agilis* (Axels.) Linnaniemi, 1907.

Description.—Length, to 1·2 mm. Colour, greyish to dark violet. Antennae slightly longer than head. Antennae IV. with terminal knob, without olfactory hairs. P.a.o. elliptical, as long as 2-3 ocelli. Ocelli, 8 on each side, equal. Clavate tibiotarsal hairs absent. Claws large, unarmed. Empodial appendage scarcely half as long as claw and with narrow angular inner lamella. Abdomen IV.-VI. distinctly separated. Rami with 4 barbs and corpus tenaculi with 2-3 setae. Furca reaching middle of abdomen II. Manubrium thickly haired dorsally, with 2 unusually long, strong distal setae ventrally. Dentes annulated, with numerous short setae. Mucro plump with 2 teeth, of which the apical is decidedly the shorter. Clothing of short and equally long hairs.

This European species has been received from Nangarra, Western Australia, November 21, 1930 (B. A. O'C.); Gooseberry Hill, Western Australia, June 2, 1932 (G. E. N.); St. Ronan's Well, Western Australia, June 11, 1932 (G. E. N.).

Proisotoma schötti (Dalla Torre, 1895). (Text fig. 6, *a-d.*)

= *Isotoma litoralis* Schött, 1893; *Isotoma schötti* Dalla Torre, 1895; *Isotoma lacustris* Schött, 1896.

Description.—Length, 2·0 mm. Colour, violet. Antennae only slightly longer than the head. Ocelli, 8 on each side. P.a.o. as long as a single ocellus. Empodial appendage with a very distinct apical bristle. Furca reaching ventral tube; dens without ventral setae, not tapering apically. Mucro with two teeth and distinct broad lamella. No clavate tibiotarsal hairs.

I have seen specimens of this common European species from the following localities:—Cannington, Western Australia, July 7, 1931 (H. W.); specimens in the South Australian Museum from Adelaide, without data; Perth, Western Australia, 1932 (H. W.); Woodside, South Australia, July, 1933 (H. W.).

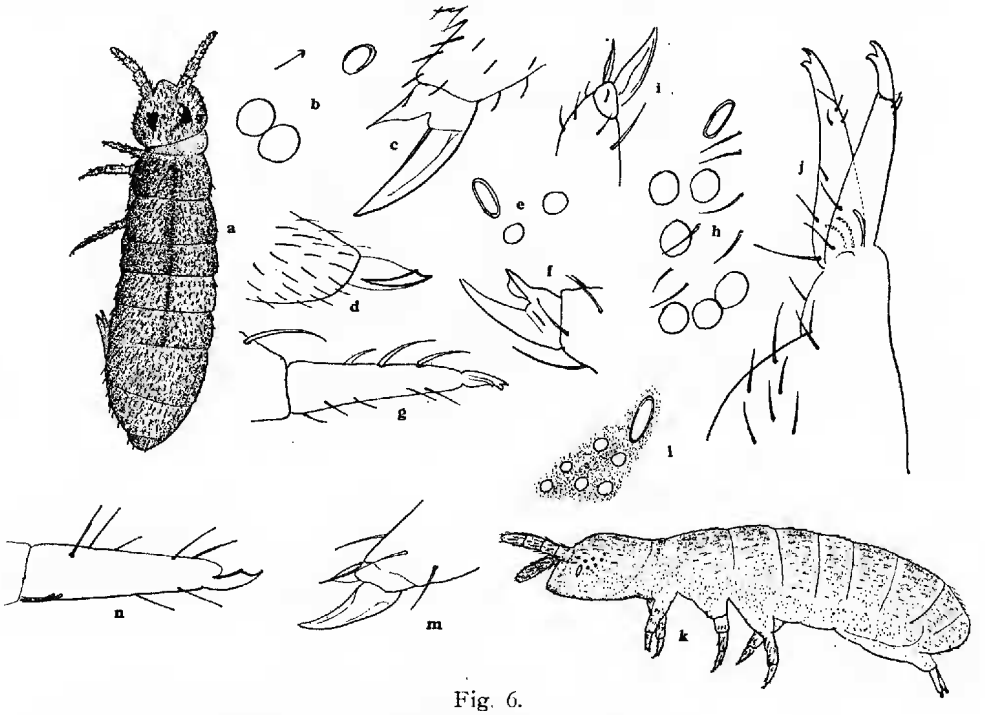

Fig. 6.

a.	*Proisotoma schötti* (Dalla Torre)	Entire animal.
b.	„ „ „ „	Anterior ocelli and postantennal organ.
c.	„ „ „ „	Claw and tip of tibiotarsus.
d.	„ „ „ „	Mucro.
e.	„ *minuta* (Tullbg.)	Anterior ocelli and postantennal organ.
f.	„ „ „ „	Claw and empodial appendage.
g.	„ „ „ „	Mucro and dens.
h.	„ *(Isotomina) pilosa,* n. sp.	Ocelli and postantennal organ.
i.	„ „ „ „	Claw and tip of tibiotarsus.
j.	„ „ „ „	Furca.
k.	*Proisotoma sexophthalma,* n. sp.	Entire animal.
l.	„ „ „	Ocelli and postantennal organ.
m.	„ „ „	Claw and tip of tibiotarsus.
n.	„ „ „	Dens and mucro.

Var. **lutea,** n. var.

Specimens collected on the beach at Hallett's Cove, South Australia, in November, 1931 (D. C. S.), only differ from the typical form in the colouration, which is of a yellowish-green with a dark medial longitudinal streak.

PROISOTOMA MINUTA (Tullberg, 1871). (Text fig. 6, *e.-g.*)

= *Isotoma minuta* Tullberg, 1871; *Isotoma troglodytica* Rainbow, 1907.

Mucrones with 3 teeth. Tibiotarsus without clavate hairs or only with two weak ones (var. *clavipila* Axels.). Ocelli, 8 on each side. Antennae only slightly longer than the head. Colour, greyish.

This is a common species in Europe, occurring in and on soil in cultivated areas. It has been recorded from Australia by Dr. J. Davidson as occurring in large numbers in the soil of a tomato-house at Glenelg, South Australia, on June 27, 1929, and the writer found it commonly at Perth and Guildford in Western Australia, in 1931.

Through the courtesy of the authorities of the Australian Museum, Sydney, I have been able to re-examine the type slides of Rainbow's *Isotoma troglodytica,* described from Yarrangobilly Caves, New South Wales, in 1907. His specimens are identical with *P. minuta,* and therefore his name must be regarded as synonymous.

Proisotoma sexophthalma, n. sp. (Text fig. 6, *k.-n.*)

Description.—Length, to 0·7 mm. Colour, greyish with light specks. Antennae slightly shorter than the head, ratio of segments = 2 : 3 : 3 : 5. Ocelli small, 6 on each side and not on pigmented patches. P.a.o. elliptical, about 5 times the diameter of an ocellus, entire. Claws unarmed. Empodial appendage with narrow inner and broader outer lamellae. No clavate tibiotarsal hairs. Furca short and stout, not reaching beyond abdomen II.; dentes and mucrones as in fig. 9 *d*. Clothing sparse, of fairly short, simple setae, scarcely longer on apical segments.

Locality.—National Park, Western Australia, September 3, 1931 (D. C. S.).

Syntypes in the South Australian Museum.

Remarks.—This very distinct species is nearest to *P. micrura* Börner from South America, which differs in having a single distinctly clavate tibiotarsal hair, longer antennae and longer mucrones.

KEY TO THE AUSTRALIAN SPECIES OF PROISOTOMA.

1. Abdominal segments V. and VI. fused. Subgenus, *Isotomina* Börner. 2
   Abdominal segments all distinctly separated. Subgenus, *Proisotoma,* Börner. 4
2. Ocelli, 8 on each side on a single dark patch. Anteapical tooth of mucro about the middle. *P. (I.) thermophila* (Axels).
   Ocelli, 6 on each side. 3
3. Ocelli in two groups on different patches of pigment only lightly joined. Mucro one-third the length of dens. Dentes haired the whole length dorsally. P.a.o. as long as three ocelli. *P. (I.) sexoculata,* n. sp.
   Ocelli in two groups, but on a single patch of pigment. Mucro half the length of dens. Dentes dorsally with a few short setae at tip. P.a.o. the length of a single ocellus. *P. (I.) pilosa,* n. sp.
4. Ocelli, 8 on each side on black patches of pigment. 5
   Ocelli, 6 on each side, small, and not surrounded with pigment. P.a.o. equal to 5 ocelli, elliptical. Small plump species. *P. sexophthalma,* n. sp.
5. Mucro, plump, with 2 teeth and a very broad, distinct lamella. No clavate tibiotarsal hairs. Furca reaching ventral tube. P.a.o. equal to a single ocellus. *P. schotti* (D.T.).
   Mucro without distinct lamella. 6
6. Mucro with three teeth. No clavate tibiotarsal hairs or only two very weak ones (var. *clavipila* Axels.). *P. minuta* (Tullberg).
   Mucro with two teeth. Claws unarmed. P.a.o. elliptical, entire, equal to 2-3 ocelli. Clavate tibiotarsal hairs absent. *P. ripicola* Linnaniemi.

Genus ISOTOMA s. str. Börner, 1906.

ISOTOMA TRIDENTIFERA Schött, 1917.

Description.—Length, to 1·5 mm. Colour, light bluish-grey. Antennae twice as long as head. Ocelli, 8 on each side, the proximal ocelli smaller. Hairs of body short, depressed, slightly longer on end of abdomen, all simple. Claws with 2 inner teeth (absent in var. *edenticulata,* n. var.). Mucro small with two teeth.

This was the first and only true species of *Isotoma* to be previously recorded from Australia. It was originally found in North Queensland. I have had specimens collected by Miss J. W. Raff, from Beechworth, Victoria, in 1932; from New Town, Tasmania, collected by Mr. V. V. Hickman, in September, 1932; and have taken it myself around Adelaide, South Australia, in 1933.

Var. **edenticulata,** n. var. (Text fig. 4, *h.*)

The type specimen of this variety was found among debris on the shore of Government House Lake, Rottnest Island, Western Australia, in 1930 (L. J. G.). Other localities are Salt Lakes, Rottnest Island, Western Australia, January, 1931 (H. W.); Crawley, Western Australia, June, 1931 (D. C. S.); You Yang Mountains, Victoria, September, 1931 (J. W. R.); Pickering Brook, Western Australia, July, 1932 (G. E. N.); Albany, Western Australia, July, 1932 (H. W.).

Type in the South Australian Museum.

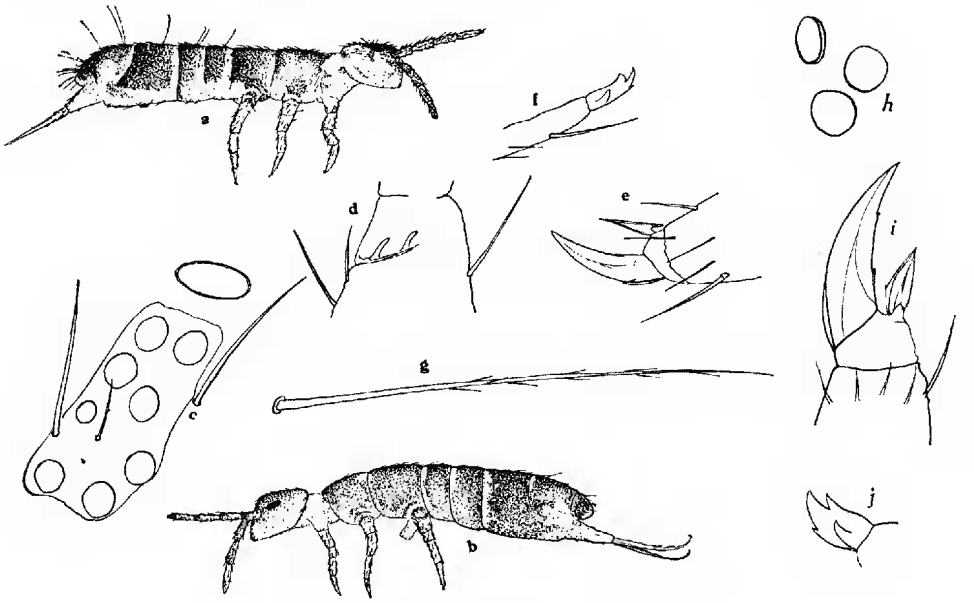

Fig. 7.

a.	*Isotoma swani,* n. sp.	Entire male animal.
b.	„ „ „	Entire female animal.
c.	„ „ „	Ocelli and p. a. o.
d.	„ „ „	Sensory organ on ant. III.
e.	„ „ „	Claw and tip of tibiotarsus.
f.	„ „ „	Mucro and tip of dens.
g.	„ „ „	Long dorsal seta of male.
h.	„ *georgiana* Schffr.	P. a. o. and anterior ocelli.
i.	„ „ „	Tip of tibiotarsus.
j.	„ „ „	Mucro.

Isotoma swani, n. sp. (Text fig. 7, *a-g.*)

Description.—Length, 1·4 mm. Colour, bluish-grey with whitish anterior margins to segments; whitish on venter, legs, furca and lower part of sides of head, prothorax and furcal segment. Antennae nearly one and three-quarter times the head length; ratio of segments = 15 : 20 : 20 : 32. Antennal organ III. as in figure 10 *d.* Ocelli, 8 on each side on dark patches, unequal. P.a.o. one and a half times the diameter of an anterior ocellus, broadly elliptical. Claws strong,

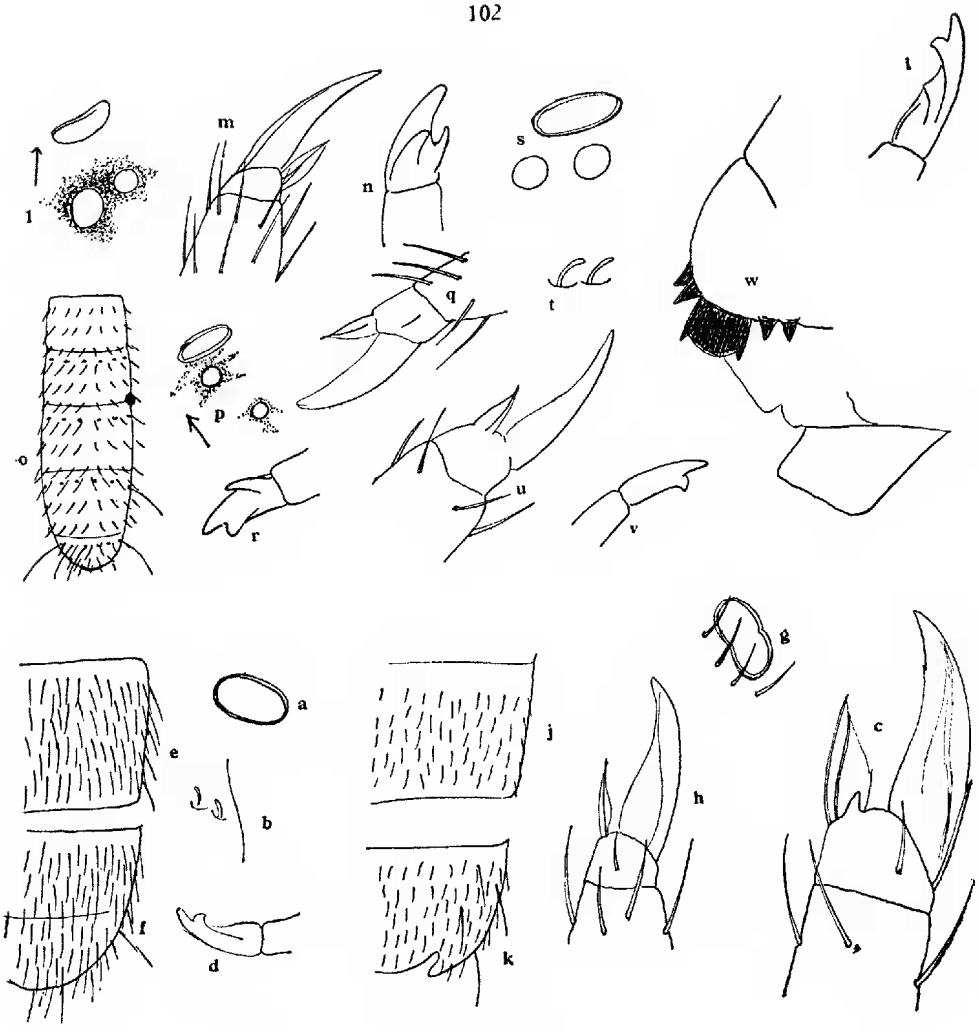

Fig. 8.

a.	*Isotoma termitophila*, n. sp.	Postantennal organ.
b.	„ „ „	Sensory organ of ant. III.
c.	„ „ „	Claw and empodial appendage.
d.	„ „ „	Mucro.
e.	„ „ „	Dorsal surface of abdom. IV.
f.	„ „ „	„ „ „ „ V. and VI.
g.	„ *linnaniemia*, n. sp.	Postantennal organ.
h.	„ „ „	Claw and empodial appendage.
i.	„ „ „	Mucro.
j.	„ „ „	Dorsal surface of abdom. IV.
k.	„ „ „	„ „ „ „ V. and VI.
l.	*Isotoma bioculata*, n. sp.	Ocelli and postantennal organ.
m.	„ „ „	Claw and tip of tibiotarsus.
n.	„ „ „	Mucro.
o.	„ „ „	Dorsal view of abdom. segments.
p.	„ *raffi* „	Ocelli and postantennal organ.
q.	„ „ „	Claw and tip of tibiotarsus.
r.	„ „ „	Mucro.
s.	*Spinisotoma dimorpha*, n. sp.	Anterior ocelli and postantennal organ.
t.	„ „ „	Sensory organ of ant. III.
u.	„ „ „	Claw and tip of tibiotarsus.
v.	„ „ „	Mucro.
w.	„ „ „	Chitinous teeth on abdom. V. of male.

with strong inner tooth at about one-third from base, and a strong outer lateral tooth. Empodial appendage with broad inner lamella, apically pointed. Clavate tibiotarsal hairs absent. Furca long, reaching ventral tube. Mucrodens twice as long as manubrium. Mucro with 4 teeth, apical very small and not reaching subapical. Clothing of moderately numerous short and fine setae. In the male on abdominal segment are some much longer and stronger curved sctae which are longer than the width of segments and coarsely ciliated; these are absent in the female.

Locality.—Holotype and allotype from National Park, Western Australia, September, 1931 (D. C. S.).

Types in the South Australian Museum.

Isotoma termitophila, n. sp. (Text fig. 8, *a-f.*)

Description.—Lcngth, to 2·5 mm. Colour, entirely white. Antennae half as long again as the head; ratio of segments = 10 : 22 : 20 : 48; antennae IV. with a terminal knob, antennal organ III. as in figure 11, *b.*, IV. without olfactory hairs. Ocelli entirely absent. P.a.o. fairly large, broadly elliptical, not medially notched. Claws strong with fine inner tooth at one-third from tip, and a prominent outer basal tooth. Empodial appendage with outer and broad inner lamellae, the inner lamella with a fine tooth at the anglc. Furca almost reaching ventral tube, dentes nearly twice as long as manubrium; mucro small with three teeth, dentes with subapical bristle reaching tip of mucro and ventrally with long setae. Rami with 4 barbs. Clothing of moderately short setae but the abdominal segments have some longer equally fine but outstanding setae; all setae simple and not ciliated.

Localities. — Type from Parkervillc, Western Australia, with termites, October, 1930 (II. W.); Armadale, Western Australia, July, 1931 (H. W. and D. C. S.); King's Park, Wcstern Australia, August, 1931 (H. W.); Crawley, Western Australia, April, 1931 (D. C. S.).

Remarks.—In morphological details this species is very close to *Isotoma sphagneticola* Axelson, but differs in having an inner and outer tooth to the claw. It should not, however, bc confused owing to its very different facies. It is of the somewhat heavier build of *Folsomia,* whereas *I. sphagneticola* is more graceful, recalling the form of the *I. notabilis* group.

Isotoma linnaniemia, n. sp. (Text fig. 8, *g.-k.*)

Description.—Length, 1·0 mm. Colour, entirely white. Facies as in *Isotoma sphagneticola* Linnan. Antennae only slightly longer than the head, ratio of segments = 6 : 12 : 12 : 16. Antennae IV. with small terminal knob but no olfactory hairs. Antennal organ III. normal. Ocelli absent. P.a.o. large, elliptical, doubly contoured and with distinct indication of division. Claws unarmed. Empodial appendage pointed, about half the length of claw with narrow outer and broad inner lamellae, inner lamella with tooth. Furca short, reaching only to posterior margin of abdomen II. Mucrodens twice as long an manubrium. Mucro with three teeth almost in a line. Clothing of numerous short, simple setae, with only a few slightly longer ones on abdomen V. and VI. Ratio of th. II. : III. : abd. I. : II. : III. : IV. : V. and VI. = 32 : 25 : 22 : 25 : 30 : 20; V. and VI. completely fused.

Localities.—Crawley, Western Australia, April, 1932 (D. C. S.); Preston Valley, Western Australia, Junc, 1931 (H. W.); Gooseberry Hill, Western Australia, June, 1932 (G. E. N.).

Type in the South Australian Museum.

Remarks.—This species, which resembles the European *I. sphagneticola* Linnan., is separated therefrom by the fewer longer setae on abdomen V. and VI.,

and on the trochanters. These setae are also quite simple and not ciliated. The p.a.o. of *I. sphagneticola* is quite entire without any medial notch, while the furca reaches the ventral tube. From *I. termitophila,* n. sp., it differs in the general facies, the form of the p.a.o., the dentition of the claw, the structure of the empodial appendage, and in the nature of the clothing.

Isotoma bi-oculata, n. sp. (Text fig. 8, *l.-o.*)

Description.—Length, 1·0 mm. Colour, white except for the eye patch which is bluish. Antennae half as long again as the head, ratio of segments = 6 : 12 : 13 : 20; antennal organ III. normal. Ocelli, two on each side, unequal, the anterior ocellus the smaller, both close together on a small blue patch of pigment. P.a.o. kidney-shaped, twice as long as the anterior ocellus. Claws long and strong with inner tooth. Empodial appendage less than half as long as claw, with inner and outer lamellae. Furca long, reaching ventral tube. Mucrodens about three times as long as manubrium; mucro with three teeth, two in line and one distinctly lateral. Ratio of th. II. : III. : abd. I. : II. : III. : IV. : V. and VI. = 35 : 25 : 14 : 16 : 20 : 21 : 15; V. and VI indistinctly separated. Clothing generally of fairly long, simple setae, but all segments have an anterior row of six or more very long curved setae which are longer than the width of the segments and ciliated on one side.

Localities.—Sherbrook, Victoria, September, 1931 (H. F. D.); Sassafras, Victoria, December, 1931 (H. G. A.).

Remarks.—This species differs abundantly from any described forms in the two ocelli on each side and in the characteristic long ciliated setae on the body segments.

Isotoma raffi, n. sp. (Text fig. 8, *p.-r.*)

Description.—Length, 0·7 mm. Colour, greyish-white except the two small dark pigmented eye-patches on each side. Antennae half as long again as the head, ratio of segments = 8 : 11 : 11 : 20, antennal organ III. normal. Ocelli, two on each side, each on a separate patch of pigment. The anterior ocellus is the larger. P.a.o. broadly oval, twice as long as the anterior ocellus and almost touching it. Claws unarmed. Empodial appendage half as long as claw and with inner and outer lamellae. Furca reaching ventral tube, mucrodens at least two and a half times as long as the manubrium, mucro as in preceding species except that the subapical tooth is distinctly distal. Clothing of numerous fine setae with a few longer and more outstanding ones on anal segments; these are not so long as in preceding species nor are they ciliated.

Syntypes from You Yang Mountains, Victoria, September 24 (Miss J. R.); in the South Australian Museum.

Remarks.—This species is very closely related to the preceding, but may be distinguished by the characters given in the key.

Isotoma notabilis Schäffer, 1896.

Description.—Length, 1·0 mm. Light greyish in colour. Body setae short, the longer ones slightly ciliated. Antennae half as long as the head. Ocelli, 4 on each side on a dark patch. P.a.o. broadly elliptical and as long as one ocellus. Claws unarmed. Empodial appendage pointed, without teeth, half the length of claw. Dens approximately three times as long as the manubrium. Mucro with 3-4 teeth, the proximal close together.

This well-known species has been found in a green-house at Adelaide, South Australia, in March, 1933 (H. M. H.).

ISOTOMA BIPUNCTATA Axelson, 1903.

Description.—Length, to 0·8 mm. Colour, white. Body setae short and simple. Antennae slightly longer than the head. Antennae IV. with a small olfactory hair and terminal papilla. Ocelli, 1 on each side on a small pigmented patch. P.a.o. elliptical, as broad as 4 ocelli. Claws unarmed. Furca reaching middle of abdomen II. Manubrium as long as mucrodens. Mucro with 2-3 teeth.

This European species was taken along with the preceding, in a greenhouse at Adelaide, South Australia, in March, 1933 (H. M. H.).

ISOTOMA OLIVACEA Tullberg, 1871.

Description.—Length, to 2·0 mm. Colour, olive-green with a lighter ground colour, sometimes bluish. Head and body with light flecks, extremities lighter. Clothing of short thick setae. Antennae half as long again as the head. Antennae IV. without olfactory hairs, with terminal knob. P.a.o. elliptical, as wide as one and a half to three ocelli. Claws with broad base, outer tooth and small inner tooth. Empodial appendage half the length of claw, with tooth at inner angle. Ratio of dens to manubrium = 44 : 19; dens dorsally annulated. Mucro with 4 teeth, apical the strongest and curved, proximal teeth equal.

This is another common European species. It was found in numbers in the laboratory at the Waite Institute, Adelaide, South Australia, in October, 1933, by Mr. J. W. Evans. The specimens had undoubtedly come from herbage growing outside.

ISOTOMA GEORGIANA Schäffer, 1891. (Text fig. 7, *h.-j.*)

Description.—Length, to 2·0 mm. (Schäffer, 3·0 mm.). Colour, dark bluish-black, uniform. Antennae rather longer than head, ratio of segments = 7 : 9 : 9 : 13. Ocelli, 8 on each side on dark patches. Postantennal organ small, about as long as an ocellus, subelliptical (not observed by Schäffer). Furca long, reaching ventral tube, mucrodens about three times as long as manubrium, dens with numerous strong setae, mucro with four teeth, the apical one small and short, the basal teeth not opposite. Claws strong with fine proximal and distal teeth. Empodial appendage pointed with inner and outer lamellae and tooth at the inner angle. Body clothing of numerous setae, most of which are strong but short, though many are much longer.

Locality.—Two specimens of this species were taken in moss in the Coorong, South Australia, on May 17, 1934 (R. V. S.).

Remarks.—Except in the postantennal organ and the shorter antennae, particularly the fourth segment which is much shorter than the head, there are no differences in my specimens from Schäffer's description. Hitherto this species has been known only from the Subantarctic, but that it should reach the coastal regions of Southern Australia is not surprising. The writer knows of several other subantarctic species which occur in New Zealand and which will be recorded in due course.

KEY TO THE AUSTRALIAN SPECIES OF ISOTOMA.

1. Ocelli, 8 on each side. 2
   Ocelli, fewer than 8 on each side. 4
2. Mucro with 4 teeth. 3
   Mucro with 3 teeth. Colour, light bluish-grey. Claw with 2 inner teeth or without (var. *denticulata* n. var.). *I. tridentifera* Schött.
3. Apical tooth of mucro long and slender, the proximal teeth on a level or nearly so. Not sexually dimorphic. P.a.o. equal to 1½-3 ocelli. *I. olivacea* Tullberg.

Apical tooth of mucro short, proximal teeth not level. Sexually dimorphic species, male with long ciliated setae on distal abdominal segments. P.a.o. equal to two ocelli. Claw without distal inner tooth. *I swani,* n. sp.

Apical tooth of mucro short, proximal teeth not opposite. Not sexually dimorphic. All setae strong and simple. P.a.o. equal to one ocellus. Claw with distal inner tooth. *I. georgiana* Schäffer.

4. Ocelli entirely absent. 8
Ocelli, 1, 2, or 4 on each side. 5

5. Ocelli, 1 on each side on a small patch of pigment. P.a.o. elliptical, equal to 4 ocelli. Colour, white. Mucro with 2-3 teeth. *I. bipunctata* Axelson.

Ocelli, 2 or 4 on each side. 6

6. Ocelli, 2 on each side. 7
Ocelli, 4 on each side on a dark patch. Colour, light bluish-grey. P.a.o. broadly elliptical, as long as the patch of pigment. Mucro with 3-4 teeth. *I. notabilis* Schäffer.

7. Both ocelli on same patch of pigment, anterior ocellus the smaller. P.a.o. kidney shaped, widely separated from anterior ocellus. Abdominal segments with a subposterior row of long, strongly ciliated setae. *I. bioculata,* n. sp.

Each ocellus on a separate patch of pigment, separated by at least two ocellar diameters. Anterior ocellus the larger, almost touching the p.a.o., this broadly oval, about twice as long as the anterior ocellus. No long ciliated setae on abdominal segments. *I. raffi,* n. sp.

8. Large, stout species of *Folsomia* facies. White. P.a.o. broadly elliptical, margins entire. Claws with inner and prominent basal teeth. Mucro with three teeth. Body segments with fairly long, fine setae, longer but simple on anal segments. Termitophilous. *I. termitophila,* n. sp.

Smaller species of *I. sphagelicola* facies. White. P.a.o. broadly elliptical, more elongate, lateral edges notched. Claws unarmed. Mucro tridentate. Body setae shorter and with fewer longer ones. *I. linnaniemi,* n. sp.

Spinisotoma Stach, 1926.

This very interesting genus was erected in 1926 for an Isotoma found in South-west Poland. It differs from related genera of the Isotominae in having a series of spines on the fifth abdominal segment. Anal spines of some form are known to occur in several genera of this subfamily, notably those placed by Börner in his tribe Anurophorini, as *Uzelia, Tetracanthella* and *Proctostephanus.* Stach's genus, however, is of typical *Isotoma* facies, and the terminal position of the anus definitely places it in the tribe Isotomini.

The genus is characterised thus:—Body elongate of *Isotoma* facies, all abdominal segments separated, antennae IV. without sensory knob at apex, ocelli 8 on each side, anus terminal, abdomen V. with anal horns or spines in both sexes or only in male, claw without tunica, no clavate tibiotarsal hairs, furca present and long and annulated, mucro of *Isotoma* type.

Spinisotoma dimorpha, n. sp. (Text fig. 8, *s.-w.*)

Description.—Length, 0·8 mm. Colour, ? (the two specimens have been mounted for some time and have lost any pigment originally present). Antennae one-third longer than head, ratio of segments = 8 : 10 : 10 : 19, antennae IV. without terminal knob, III. with sensory organ as in figure 12, *i.* Ocelli, 8 on each side on dark patches. P.a.o. about twice an ocellus in diameter. Claws unarmed. Empodial appendage with narrow inner and broader outer lamellae. Furca long but only reaching anterior margin of abdomen II. Mucrodens twice as long as manubrium, mucro small with two teeth. Relative lengths of body segments = th. II. : III. : abd. I. : II. : III. : IV. : V. : VI. = 25 : 30 : 18 : 20 : 20 : 20 : 10 : 5. Abdomen V. posteriorly in male with 6 strong and

stout heavily chitinised yellow spines or teeth arising directly from the cuticle; the two outer spines on each side are triangular and only slightly longer than broad at their base; the two inner ones are rather longer and joined together just below their apices to form a saddle piece. Clothing of numerous short and fine setae, none of which are much longer towards the apex.

Locality.—One male and one female in grass sweepings at Urrbrae, South Australia, in October, 1929 (D. C. S.).

Types in the South Australian Museum.

Remarks.—The structure of the spines in this species differs from those of the genotype *Spinisotoma pectinata* Stach, in that they arise direct from the cuticle or surface of the segment. In Stach's species they are only four in number and placed on distinct and prominent papillae. The crown of thorns (about 30) on the same segment in *Proctostephanus stuckeri* Börner appears to be of a similar nature to those in our species, but *Proctostephanus* is placed by Börner in the tribe Anurophorini.

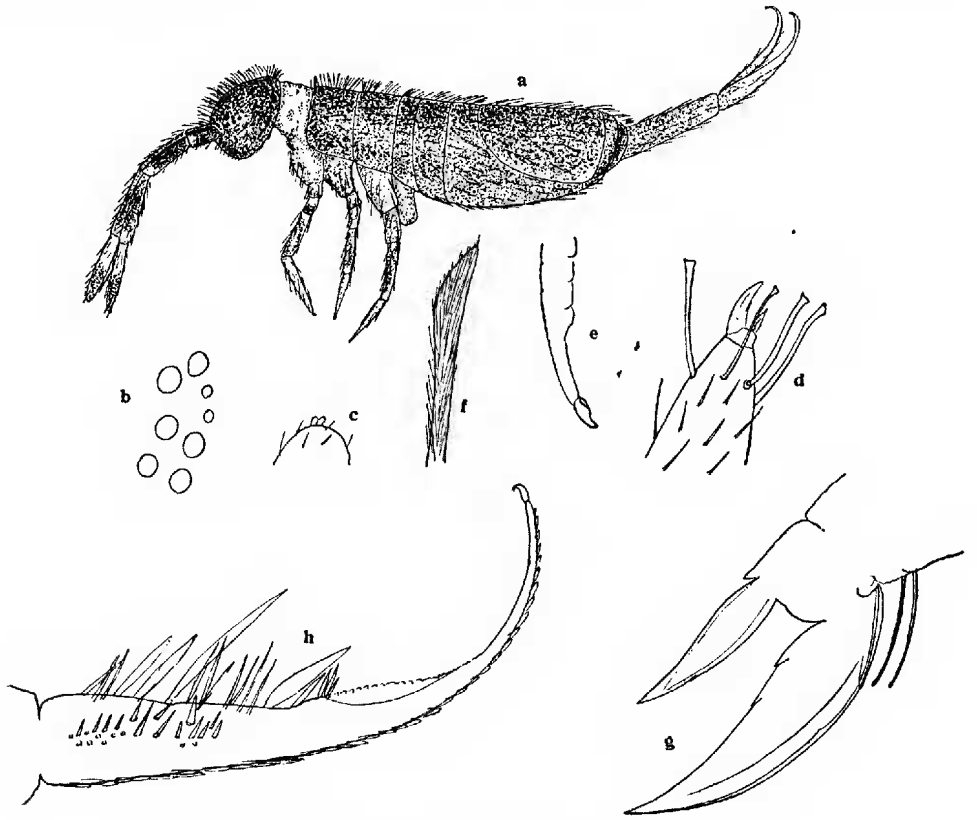

Fig. 9.

a.	*Isotobrya wheeleri*, n. g., n. sp.	Entire animal.
b.	„ „ „ „	Ocelli.
c.	„ „ „ „	Tip of ant. IV.
d.	„ „ „ „	Tip of tibiotarsus.
e.	„ „ „ „	Mucro and tip of dens.
f.	„ „ „ „	Ciliated thoracic hair.
g.	*Lepidophorella australis* Carp.	Claw, empodial appendage, and tip of tibiotarsus.
h.	„ „ „	Dens and mucro.

Genus **Isotobrya,** gen. nov.

Description.—General facies of *Entomobrya* type. Abdomen IV. several times longer than III. Antennae long, 4-segmented, IV. with double terminal knob. Clavate tibiotarsal hairs present. Claws simple, of *Isotoma* type. Furca long, dentes faintly annulated, mucro falciform. Clothing of numerous long ciliated setae which are clavate on the head and thorax. Abdominal segments apparently without sensory setae. Empodial appendage present. Scales absent.

Remarks.—This genus is extremely interesting in that it connects in many characters the subfamilies Isotominae and Entomobryinae. In its general form and clavate ciliated thoracic setae it agrees with the latter; in its simple claws with the former.

Genotype.—*Isotobrya wheeleri,* n. sp.

Isotobrya wheeleri, n. sp. (Text fig. 9, *a.-f.*)

Description.—Length, 2·0 mm. Colour, blackish, except on legs, furca, prothorax and base of antennae IV., which are white. Antennae nearly three times as long as head, ratio of segments = 6 : 10 : 7 : 10. Ocelli, 8 on each side, unequal, not on a dark patch. P.a.o. absent. Legs long, tibiotarsus with 4 clavate tibiotarsal hairs; claws with faint inner tooth about the middle. Empodial appendage simple, lanceolate and half as long as claw. Furca reaching ventral tube, ratio of manubrium to mucrodens = 20 : 20, mucro falciform with small basal lamellae, but without basal spine. Clothing of numerous long ciliated setae, many on the head and thorax clavate. Abdominal sensory setae absent. Termitophilous.

Four specimens of this interesting species were found under a stone with termites at Mullewa, Western Australia, on September 9, 1931. As the writer was with that delightful companion and entomologist, Professor W. M. Wheeler, of Harvard, when the specimens were taken, it is with very pleasant memories that his name is associated with the species.

Syntypes in the South Australian Museum.

Family TOMOCERIDAE (Schäffer, 1896).

Subfamily LEPIDOPHORELLINAE (Börner, 1897).

Genus Lepidophorella Schäffer, 1897.

Syn. = *Drepanura* Moniez, 1894; nec. Schött, 1891.

Lepidophorella australis Carpenter, 1925. (Text fig. 9, *g.-h.*)

Description.—Length, 3-4 mm. Colour, pale straw-yellow with basal rings on the second antennal segment, and the whole of the fourth segment dark purple; also with dark patches dorsally on thorax II. and abdomen I., II., IV. and V. Antennae three-fourths as long again as head, ratio of segments = 8 : 18 : 18 : 24. Ocelli, 8 on each side on dark fields. P.a.o. absent. Thorax II. two and a quarter times as long as III. Abdomen III. a third as long again as IV. Claws with strong dorsolateral and two prominent inner teeth. Empodial appendage lanceolate. Dentes one-third as long again as the manubrium, mucro falciform with upturned apex. Tibiotarsi with clavate hairs. Body covered with ribbed scales.

Locality.—Sherbrook, Victoria, April, 1931 (H. F. D. & H. G. A.).

Remarks.—This species, not previously recorded from Australia, was originally described from Campbell Island, New Zealand, by Dr. Carpenter in 1925. The above brief characters are taken from his description, but the figures are from Australian specimens. From the following species, *L. brachycephala*

(Moniez), which also occurs in both countries, it differs in having only two inner teeth to the claw and in the presence of the clavate tibiotarsal hairs.

LEPIDOPHORELLA BRACHYCEPHALA (Moniez).

= *Drepanura brachycephala* Moniez.

Localities.—Launceston, Tasmania, August, 1929 (V. V. H.); Cascades, Tasmania, August, 1932 (V. V. H.); Mount Nelson, Tasmania, September, 1932 (V. V. H.).

Family ENTOMOBRYIDEA Börner, 1913.

Subfamily ENTOMOBRYINAE Börner, 1906.

Tribe ENTOMOBRYINI Börner, 1906.

Genus SINELLA Brook, 1882.

SINELLA COECA (Schött), 1896; (Text fig. 10, *a.-b.*)

= *Entomobrya coeca* Schött, 1896; *Sinella hofti* Schäffer, 1896; *Sinella tenebricosa* Folsom, 1902.

Description. Length, to 2·0 mm. Entirely white and without ocelli. Hairs thick and close-lying, ciliated. Clavate tibiotarsal hairs absent. Claw with two large wing-like teeth basally on inside, and a strong inner tooth. Empodial appendage with outer wing-like tooth. Mucro falciform with strong basal spine.

This is a well-known European species which is found under stones in the open and under boards and plant-pots in green-houses. I have seen specimens from the following Australian localities:—Perth, Western Australia, in September and October, 1930 (H. W.); Bridgetown, Western Australia, December, 1930 (H. W.); Denmark, Western Australia, September, 1932 (H. W.); Brisbane, Queensland, October, 1932 (R. J. M. B.); Adelaide, South Australia, 1933 (H. W.).

SINELLA TERMITUM Schött, 1917. (Text fig. 10, *c.*)

= *Entomobrya cuniculicola* Pritchard, 1932.

Description.—Length, 1·0 mm. Colour, white with some small red pigment spots occasionally on head and thorax. Occasionally pigmented eye-spots are present. Antennae twice as long as head, IV. without terminal knob but with thick outstanding bristles. Thorax II. distinctly longer than III. Abdomen IV. three to four times as long as III. Claw with small lateral tooth and two unequal inner wing-teeth. Empodial appendage with large outer wing-tooth. Mucro with two teeth and basal spine. Body hairs strongly ciliated, clavate on head and thorax.

This common species was, except for the mucro, well figured by Schött. It is easily separated from the only other blind species by the bidentate mucro. It was recorded by Schött from North and South Queensland, but is widely distributed in all the southern portion of Australia, occurring with various species of ants and termites.

Localities.—Armadale, Western Australia, July, 1930 (D. C. S.); Beverley, Western Australia, October, 1930 (H. W.); Mundaring, Western Australia, February, 1930 (H. W.); Mount Lofty Ranges, South Australia, March, 1931 (D. C. S.); Sherbrook, Victoria, April, 1931 (H. G. A. and H. F. D.); Mandurah, Western Australia, April, 1931 (H. W.); Glen Osmond, South Australia, 1933 (H. W.); Reedbeds, South Australia, April, 1933 (H. W.); Victor Harbour, South Australia, January, 1934 (H. W.); Adelaide, South Australia, March, 1934, along with *Coptotermes*, sp. (H. W.).

Genus ENTOMOBRYA Rondani, 1861.

Syn. = *Podura* Linne, 1740 (ad partem); *Chorutes* Burmeister, 1838 (ad partem); *Isotoma* Bourlet, 1839 (ad partem); *Degeeria* Nicolet, 1841 (ad partem).

In this genus few characters of morphological importance are available for specific purposes, and one is therefore almost wholly forced to rely on colour and markings.

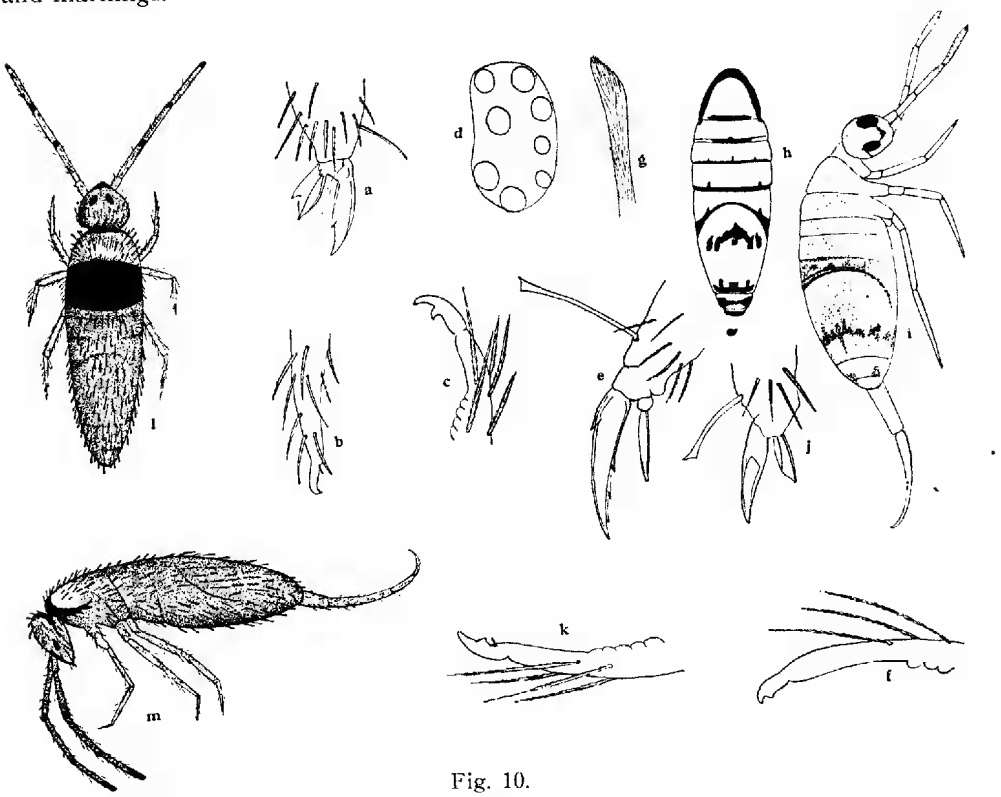

Fig. 10.

a.	*Sinella coeca* Schött.	Claw, empodial appendage and tip of tibio-tarsus.
b.	„ „ „	Mucro and tip of dens.
c.	„ *termitum* „	Mucro and tip of dens.
d.	*Entomobrya clitellaria* Guth.	Occlli.
e.	„ „ „	Claw, empodial appendage and tip of tibio-tarsus.
f.	„ „ „	Mucro and tip of dens.
g.	„ „ „	Ciliated thoracic hair.
h.	„ *multifasciata* Tllbg.	Dorsal markings.
i.	*Entomobrya maritima*, n. sp.	Entire animal.
j.	„ „ „	Claw, empodial appendage and tip of tibio-tarsus.
k.	„ „ „	Mucro and tip of dens.
l.	*Entomobrya clitellaria* Guth.	Typical form, dorsal view.
m.	„ „ *v. newmani*, n. v.	Lateral view.

ENTOMOBRYA CLITTELARIA Guthrie, 1902. (Text fig. 10, *d.-g.; l.-m.*)

This species was originally described by Guthrie from Minnesota, U.S.A., and has not hitherto been found outside of America. In Western and South Australia it is widely distributed. The typical form described by Guthrie has the

black band extending to the posterior margin of the third thoracic segment, whereas in the common form in Australia this band ends sharply at the anterior margin of the second abdominal segment. The ground colour is golden yellow, except on the mesothorax where it is white medially. There is a black neck-band and the tips of antennae II., III. and IV. are black. This, the common Australian form, does not differ sufficiently from the American to warrant a varietal name, but there occurs another form in which the black band on the body is entirely wanting. To this form I give the name of *E. clittelaria* var. **newmani,** after Mr. L. J. Newman, Government Entomologist of Western Australia. In addition to both forms being widely occurring in Western and South Australia, I have also received specimens from Studley Park, Victoria, August, 1931 (H. G. A.).

ENTOMOBRYA MULTIFASCIATA (Tullberg, 1871). (Text fig. 10, *h.*)

= *Degeeria multifasciata* Tullberg, 1871; *Entomobrya decemfasciata* (Packard, 1873), Handschin, 1929.

In this species there is a narrow black band on the front of the mesonotum, another on the posterior edge, and also on the posterior edge of the metathorax and all abdominal segments. There is also an irregular band in the middle of abdomen IV. In these markings there is considerable variation and on the strength of the bands not being broken in the middle in some specimens, Handschin (134) resurrected Packard's species *decemfasciata.* In correspondence, Dr. Folsom and Prof. Mills, in America, have criticised this action on the ground that it is impossible now to know what species Packard had before him. The differences in the markings are so small that I am inclined to agree, and herewith place all my material under Tullberg's name, although all specimens seen from Australia (as well as those which I have recently recorded from South Africa) agree with Handschin's data for Packard's form.

This species is almost cosmopolitan in its distribution, and in Australia is to be found in most cultivated places in the southern and western States.

ENTOMOBRYA MARGINATA (Tullberg, 1871).

= *Degeeria marginata* Tullberg, 1871; ? *Entomobrya multifasciata* Brook, 1883; *Entomobrya coerulea* Becker, 1902.

This species was recorded in its typical form from North Queensland by Schött in 1917. It is of a uniform lighter or darker violet colour with the posterior edges of the segments having a fine darker edging. In his paper Schött also described a new variety, *laticlavia,* in which the junctions of the tergites are without pigment and the free edges of thorax II. and III. have a broad dark border.

The typical form is plentiful in cultivated places in both Western and South Australia.

The pale variety, *pallida* Krausbauer, 1902, has not previously been recorded from Australia, although it is known from the Bismarck Archipelago. I have taken it at Murcsk, October, 1930, and Mullewa, September, 1931, both in Western Australia.

ENTOMOBRYA TERMITOPHILA Schött, 1917.

A single specimen of this striking form was taken from moss from Mount Gambier, South Australia, in May, 1934 (R. V. S.).

ENTOMOTRYA VIRGATA Schött var. **nigrella** var. nov.

This variety differs from the typical form only in that the pigment is continuous between the bands on metanotum and third abdominal segment. A single

specimen was collected from moss from Waterfall Gully, South Australia, in May, 1934 (R. V. S.).

Type in the South Australian Museum.

ENTOMOBRYA TENUICAUDA Schött, 1917.

This species was described by Schött from the Mjöberg material collected in South Queensland. It was very well figured in his paper. I have taken specimens at Muresk, Western Australia, in October, 1939, and have also received specimens found in garden rubbish at New Town, Tasmania, in September, 1932, collected by Mr. V. V. Hickman.

ENTOMOBRYA LAMINGTONENSIS Schött, 1917.

This is an entirely blue species, except for the depigmented flecks and streaks on the anterior part of abdomen IV. It was originally described from the Mjöberg material collected in South Queensland. It is very closely related to *E. ambigua* Schött from North Queensland, which differs only in that the ante-apical tooth of the mucro is reduced. My records for this species are as follows:—Perth, Western Australia, November 18, 1930 (H. W.); Nangara, Western Australia, November 21, 1930 (B. A. O'C.); Mundaring, Western Australia, February, 1931 (H. W.); Crawley, Western Australia, 1931 (H. W.); You Yang Mountains, Victoria, September 24, 1931 (J. R.); Adelaide, South Australia, May, 1933 (H. W.); in moss, Waterfall Gully, South Australia, May 6, 1933 (H. W.).

ENTOMOBRYA VARIA Schött, 1917.

Specimens referable to this well described and figured species were collected in large numbers by sweeping the low herbage in King's Park, Perth, Western Australia, on September 5, 1931. It also occurred in large numbers under the loose bark of Karri trees at Denmark, Western Australia, and was found commonly in a similar habitat but on Eucalypts at Morialta, South Australia.

Entomobrya maritima, n. sp. (Text fig. 10, *i.-k.*)

Description.—Length, to 2·0 mm. Colour, yellowish with a dark spot between the antennae connected by a black line to the black ocellar patches. Third abdominal segment with posterior edge black, then a lighter line followed by a dark irregular band; abdomen IV. with an irregular dark cross band placed rather beyond the middle. Posteriorly on abdomen IV. is a pair of lateral black spots. Antennae three times as long as head, ratio of segments = $2\frac{1}{2}$: 6 : 6 : 7. Ocelli, 8 on each side, equal. Mesothorax nearly twice as long as metathorax. Claws as in the genus but entirely without inner or lateral teeth. Empodial appendage apically with inner lamella. Tibiotarsus with strong, apically spathulate spur hair. Mucro bidentate with basal spine, unannulated portion of dens three times as long as mucro. Abdomen IV. in medial line about five times as long as III. Clothing of the usual ciliated hairs, clavate on thorax and head.

Locality.—Beneath and on the surface of stones between tide marks at Christie's Beach, South Australia, January 17, 1932 (D. C. S.).

Syntypes in the South Australian Museum.

ENTOMOBRYA NIVALIS Linne, 1758, f. IMMACULATA Schäffer, 1896.

= *Entomobrya nivalis-pallida* Carl, 1901; *Degeeria lanuginosa* Nicolet, 1841; *Entomobrya multifasciata-lanuginosa* Brook, 1884; *E. flava* Lie-Pettersen, 1896.

This is a well-known European species of which the form *immaculata* Schäffer occurs commonly around Adelaide, South Australia, on cultivated land.

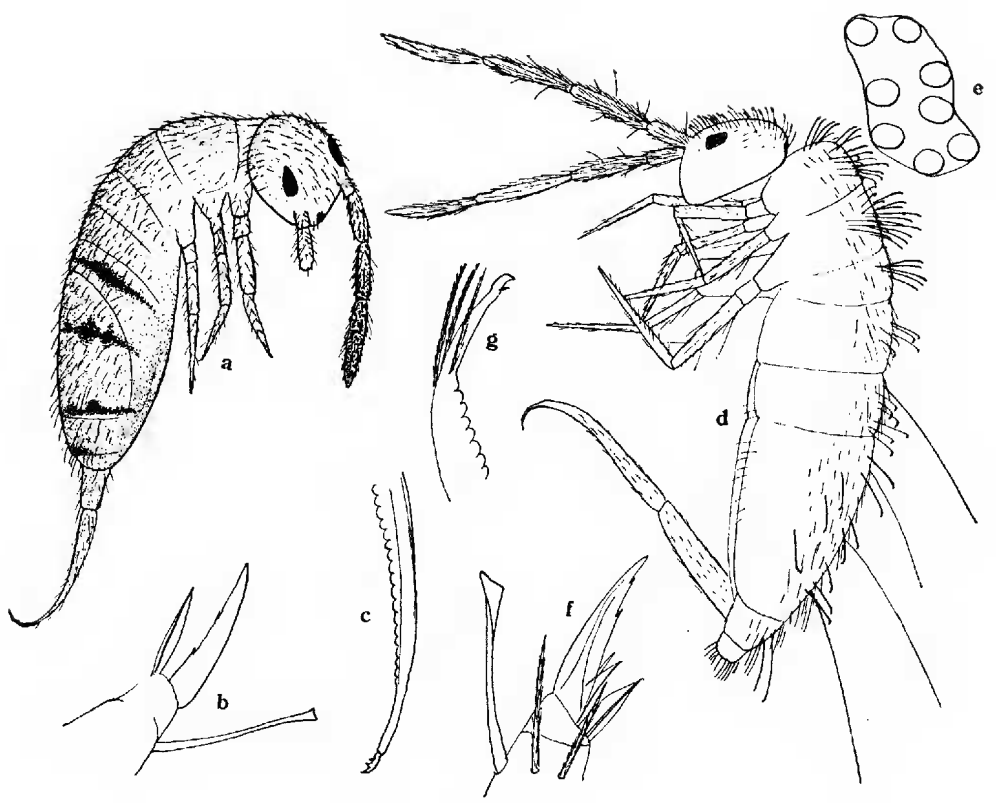

Fig. 11.

a. *Entomobrya mitchelli*, n. sp. Entire animal.
b. „ „ „ Claw, empodial appendage, and tip of tibiotarsus.
c. „ „ „ Mucro and tip of dens.
d. *Drepanura citricola*, n. sp. Entire animal.
e. „ „ „ Ocelli.
f. „ „ „ Claw, empodial appendage, and tip of tibiotarsus.
g. „ „ „ Mucro and tip of dens.

Entomobrya mitchelli, n. sp. (Text fig. 11, *a.-c.*)

Description.—Length, 1·2 mm. Colour, light yellowish-green with a blue cross-patch on abdomen III. and two on IV.; ocellar patches blue-black. Ocelli, 8 on each side. Antennae twice, or nearly so, as long as the head; ratio of segments = 3 : 6 : 6 : 9. Mesothorax one and three-fifth times as long as metathorax. Claws narrow, with two indistinct inner teeth and a lateral tooth. Empodial appendage lanceolate, reaching well beyond the distal inner tooth of claw. Furca long and thin, annulated. Mucro bidentate with basal spine. Unannulated portion of dens 3-4 times as long as mucro. Clothing normal.

This species was originally obtained by sweeping the low herbage in King's Park, Perth, Western Australia, in September, 1931 (H. W.), and later at Mount Barker, Western Australia, in September, 1932 (H. W.). It is named after Sir James Mitchell, then Premier of Western Australia.

Syntypes in the South Australian Museum.

Entomobrya tasmanica, n. sp. (Text fig. 12, *a.-c.*)

Description.—Length, 1·4 mm. Colour, light but with heavy broad blue bands on all segments and occupying the whole of the meso- and metathoracic segments and quite the posterior halves of the other segments. Antennae rather less pigmented, blue on the whole of III. and IV. and apically on I. and II. Antennae about twice as long as head. Ocelli, 8 on each side, the proximal pair very small and inconspicuous. Claws typical of the genus without lateral tooth, with a proximal pair of large and prominent teeth at about the middle of the inner edge, then a very distinct inner tooth followed by a finer more distal tooth. Empodial appendage not reaching the proximal teeth of claw, truncate apically. Furca long and reaching abdomen I., mucro bidentate with basal spine, annulated portion of dens five times as long as mucro and with three long ciliated setae. Mesothorax slightly longer than metathorax. Abdomen IV. five times as long as III. Clothing normal.

Locality.—Two specimens collected in the Domain, Hobart, Tasmania, in October, 1932, by Mr. V. V. Hickman.

Syntypes in the South Australian Museum.

KEY TO THE AUSTRALIAN SPECIES OF ENTOMOBRYA.

1. Insects of a uniform colour. 8
   Insects marked with cross-bands or irregular markings. 2
2. Markings consisting of irregular spots, more or less forming longitudinal streaks. *E. varia* Schött.

   Markings in the form of broad bands occupying most of the posterior portions of the segments. *E. tasmanica,* n. sp.
   With narrow bands or banded on certain segments only. 3
3. With only a single cross-band on thorax or abdomen. 4
   With many cross-bands. 5
4. Black band on thorax III., abdomen I. and II. (or absent = var. *newmani* n. var.). Golden yellow species with thorax II. dorsally white. *E. clitellaria* Guthrie.

   Black cross-bands on abdomen III. and anterior part of IV. Yellowish-white species. Termitophilous. *E. termitophila* Schött.
5. Species with 3 to 4 broad cross-bands. 6
   Species with more, 8 to 10 narrower bands. 7
6. White species with broad cross-bands on thorax III., abdomen III. and posterior edge of IV., or this area all pigmented; also with a thin dark line on II. on the posterior border. Posterior edges of abdomen V., and all of VI., darkish. *E. virgata* Schött.

   Yellowish species with dark irregular bands of pigment on abdomen III., and just beyond middle of abdomen IV., and laterally on V. Empodial appendage truncate apically and broad. *E. maritima,* n. sp.
7. Three bands of dark pigment, one across middle of abdomen III., one just about middle or before of IV., and another posteriorly on IV. Empodial appendage normal. *E. mitchelli,* n. sp.
7. Dorsal bands broad, on abdomen II. extending the whole length of segment. Anteapical tooth of mucro reduced. *E. tenuicauda* Schött.

   Dorsal bands much narrower, largely confined to posterior margins of segments, interrupted or not in the middle. *E. multifasciata* (Tullberg)
8. Colour entirely yellowish-green, except for the ocellar patches and a spot between the antennae. *E. nivalis* Linne; f. *immaculata* Schäffer.
   Colour otherwise. 9
9. Anteapical tooth of mucro reduced, almost a falciform mucro. Colour entirely blue. *E. ambigua* Schött.

   Anteapical tooth of mucro normal. 10

10. Deep blue with depigmented flecks and streaks on abdomen IV. Mucro with two well developed teeth and basal spine. *E. lamingtonensis* Schött.

Pigment of a light violet or cobalt blue, with darker hind edges to segments. 11

11. Darker hind edges of segments present. *E. marginata* (Tullberg); var. *pallida* Krausbauer.

12. Pigmentation violet and uniform, exeept for the darker posterior margins of segments. *E. marginata* (Tullberg) *f. p.*

Pigmentation of a light cobalt blue. Intermediate portions of tergites without pigment. Hind margins of segments with a broader, darker band. Apical tergite and between antennae bases blaek. *E. marginata* (Tullberg); var. *laticlavia* Sehött.

Genus Drepanura Schött. 1891 (nec. Monicz, 1894).

This genus, erected by Schött in 1891 (223) for *Drepanura californica,* differs from the preceding in having a falciform instead of a bidentate mucro. Since then it appears to have been ignored by other workers, and even in his own paper (226) Schött does not use it and places three species with falciform mucro in the genus *Entomobrya*. Recent workers on other groups of genera such as those previously included in the old genus *Lepidocyrtus* of Bourlet have made use of this difference in the form of the mucro to divide them up; it would therefore seem perfectly justifiable to resurrect the genus *Drepanura* with *D. californica* Schött as the genotype.

Some three years later than Schött, Moniez used the name *Drepanura* for a species *D. brachycephala* from New Zealand. It has been shown by Denis, however, that the name was misapplied and that Moniez's species belongs to the genus *Lepidophorella.*

Drepanura cobaltina (Schött, 1917).

= *Entomobrya cobaltina* Schött.

Description.—Length, to 1·0 mm. Colour, entirely cobalt blue. Antennae scarcely twice as long as the head. Thorax II. half as long again as III. Abdomen IV. four and a half times as long as III. Ocelli, 8 on each side on dark patches. Claw with two distal teeth. Empodial appendage pointed. Mucro falciform with basal spine.

Locality.—Muresk, Western Australia, in October, 1920 (H. W.).

Drepanura citricola, n. sp. (Text fig. 11, *d.-g.*)

Description.—Length, to 2·0 mm. Colour, light yellowish-green, except for the black ocellar patches. Ocelli, 8 on each side, equal. Antennae three times as long as the head, ratio of segments = 5 : 12 : 10 : 12. Ratio of meso- to metathorax = 10 : 6. Claws with a pair of large basal teeth and two distal inner teeth. Empodial appendage lanceolate with narrow outer and broader inner lamellae. Tibiotarsal spur hair long, strong and spathulate and reaching the first of the distal teeth of the claw. Furca long, dentes annulated, mucro falciform with strong basal spine. Unannulated portion of dens twice as long as the mucro. Ratio of length of abdomen III. : IV = 1 : 3-4. Clothing of numerous long ciliated hairs which are clavate on thorax and head; on abdomen III. to V. the longer hairs are pointed and as long as the length of abdomen IV.

Locality.—Perth, Western Australia, October, 1930 (H. W.), and onwards.

Remarks.—This species is very common in the Perth area and can be got in large numbers by sweeping the native bush. It also frequents cultivated flowers in gardens and is occasionally found indoors. In the South Australian Museum

are some specimens labelled as from "Townsville, North Queensland, under boards" but without any date.

Type and *paratypes* in the South Australian Museum.

DREPANURA COERULEOPICTA (Schött, 1917).

= *Entomobrya coeruleopicta* Schött, 1917.

Description.—Length, to 1·5-2·0 mm. Colour, whitish with bluish cross bands on posterior edges of segments. Antennae 2½-3 times as long as head. Thorax III. : IV. = 1 : 3. Ocelli, 8 on each side. Tibiotarsal spur hair as long as claw. Claw slender, with one medial and one distal inner tooth. Empodial appendage lanceolate. Ratio of manubrium to mucrodens = 1 : 1½. Mucro falciform with basal spine.

Localities.—Waterfall Gully, South Australia, May, 1933 (H. W.); Glen Osmond, South Australia, July, 1933 (H. W.).

Remarks.—The specimens from the above localities have the bluish pigmentation somewhat more diffuse than indicated in Schött's figure.

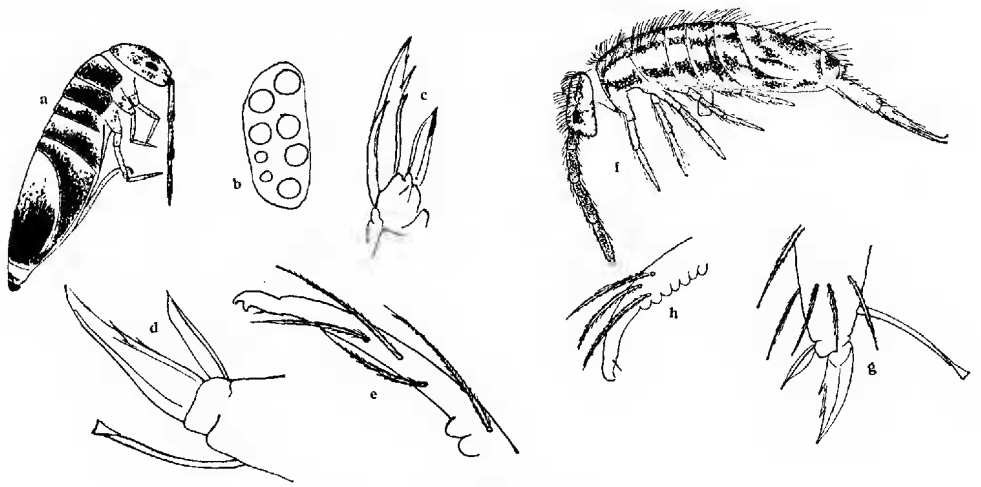

Fig. 12.

a.	*Entomobrya tasmanica,* n. sp.	Entire animal.
b.	„ „ „	Ocelli.
c.	„ „ „	Claw, empodial appendage, and tip of tibiotarsus.
d.	„ „ „	„ „ „ another view.
e.	„ „ „	Mucro and tip of dens.
f.	*Drepanura cinquilineata,* n. sp.	Entire animal.
g.	„ „ „	Claw, empodial appendage, and tip of tibiotarsus.
h.	„ „ „	Mucro and tip of dens.

Drepanura cinquilineata, n. sp. (Text fig. 12, *f.-h.*)

Description.—Length, to 1·4 mm. Colour, yellow with five longitudinal brownish-black stripes. Antennae two and a half times as long as the head, ratio of segments = 5 : 12 : 10 : 13. Mesothorax half as long again as the metathorax. Furca reaching posterior edge of abdomen II. Ratio of manubrium to mucrodens = 17 : 24. Mucro falciform with basal spine, one-third the length of hind claw. Ocelli, 8 on each side on dark patches. Claws with basal tooth and one, more distal, tooth. Empodial appendage reaching to or just beyond the distal tooth of the claw, pointed. Clothing normal.

Localities.—On garden flowers, Bridgetown, Western Australia, June, 1932 (H. G. A.); Muresk, Western Australia, 1932 (H. W.); Mount Barker, Western

Australia, September, 1932 (H. G. A.); Victor Harbour, South Australia, January, 1934 (H. W.).

Type in the South Australian Museum.

KEY TO THE AUSTRALIAN SPECIES OF DREPANURA SCHÖTT.

1.	Unicolourous species.	2
	Species with cross-bands or longitudinal streaks.	3
2.	Entirely blue species.	*D. cobaltina* (Schött).
	Yellowish-green species.	*D. citricolor*, n. sp.
3.	Banded species.	4
	With five longitudinal stripes.	*D. cinquilineata*, n. sp.
4.	Thorax I., abdomen II., III., and most of IV. black, rest white.	*D. albocoerulea* (Schött).
	Yellowish-white with narrow bluish cross-band on abdomen III. and IV.	*D. coeruleopicta* (Schött).

Genus PSEUDOSINELLA Schäffer, 1897.

Syn. = *Lepidocyrtus* Packard, 1873; *Tullbergia* Lie-pettersen, 1896; *Sira* Schäffer, 1900.

PSEUDOSINELLA DUODECEMOCULATA Handschin, 1928. (Text fig. 13, *e.*)

Description.—Length, to 2·5 mm. Colour, yellowish-white. Ocelli, 6 on each side on a dark patch. Claw with inner tooth and basal wing-like tooth. Empodial appendage lanceolate, simple.

Locality.—Two specimens were taken in moss at Crawley, Western Australia, in 1931 (H. W.).

Pseudosinella fasciata, n. sp. (Text fig. 13, *a.-d.*)

Description.—Length, 1·5 mm. Colour (in spirit, denuded of scales), dirty yellow with a band of blue pigment on abdomen III., other segments with a slight suffusion of blue dorsally. Antennae half as long again as the head, ratio of segments = 10 : 25 : 25 : 37. Ocelli, 6 on each side as in the preceding species, on a dark patch. Mesothorax half as long again as the metathorax. Claws with a pair of basal wing-like teeth on inner side and a faint distal inner tooth. Empodial appendage broad and apically truncate. Tibiotarsal spur hair pointed. Abdomen IV. four times as long as III. Clothing of simple, oval or rounded scales. Furca stout, manubrium slightly longer than the mucrodens, both dentes and manubrium heavily scaled. Mucro bidentate with basal spine. Appendages and body segments heavily beset with setae which are finely ciliated. On the thoracic segments the setae are clavate.

Localities.—In hot-house, Perth, Western Australia, February, 1931 (H. W.); Sherbrook Falls, Victoria, April, 1931 (H. G. A.); Sassafras, Victoria, December, 1932 (H. G. A.).

Type in the South Australian Museum.

PSEUDOSINELLA SEXOCULATA Schött, 1902.

= *Pseudosinella voigtsi* Börner, 1903. *Lepidocyrtus sexoculata* Guthrie, 1903; Wahlgren, 1906; Linnaniemi, 1912.

A species very close to *P. duodecemoculata* Handschin but differing in the number of ocelli, 3 on each side instead of 6.

Locality.—Beverley, Western Australia, October 7, 1930.

PSEUDOSINELLA MARTELLI (Carpenter, 1895). (Text fig. 13, *f.*)

= *Cyphoderus martelli* Carp., 1895; *Pseudosinella immaculata* Schött, 1902; *P. argentata* Folsom, 1902; *Lepidocyrtus cavernarum* Stach, 1922.

Description.—Length, 2·0 mm. Silvery white. Ocelli entirely wanting. Body heavily scaled. Claw with a large basal wing-tooth as well as a smaller one, and with two distal inner teeth. Empodial appendage half as long as claw and with rounded outer lamella. Spathulate tibiotarsal hair present but often weak. Mucro falciform with basal spine.

Locality.—In numbers under plant pots in the hot-houses of Government House, Perth, Western Australia, in 1931 (H. W.).

Remarks.—This is a well-known species in Europe and America, occurring in caves, under stones, etc.

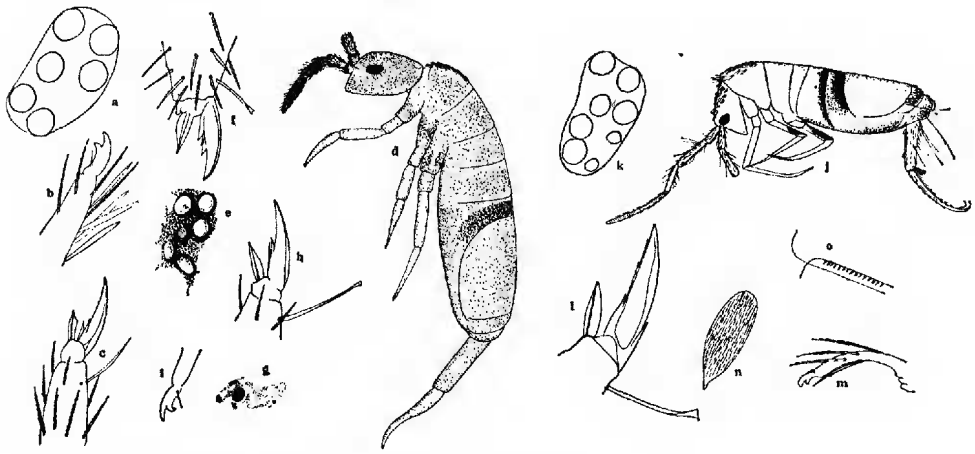

Fig. 13.

a. *Pseudosinella fasciata,* n. sp. Ocelli
b. „ „ „ Mucro and tip of dens.
c. „ „ „ Claw, empodial appendage, and tip of tibiotarsus.
d. „ „ „ Entire animal.
e. „ *duodecimoculata* Hndn. Ocelli (after Handschin).
f. „ *martelli* Carp. Claw, empodial appendage, and tip of tibiotarsus (after Handschin).
g. „ *unioculata,* n. sp. Ocellus.
h. „ „ „ Claw, empodial appendage, and tip of tibiotarsus.
i. „ „ „ Mucro.
j. *Mesira fasciata,* n. sp. Entire animal.
k. „ „ „ Ocelli.
l. „ „ „ Claw and empodial appendage.
m. „ „ „ Mucro and tip of dens.
n. „ „ „ Scale.
o. „ „ „ Spines on posterior edge of head.

Pseudosinella unioculata, n. sp. (Text fig. 13, *g.-i.*)

Description.—Length, to 0·8 mm. Colour, white, except for a little blue pigment around the deeply pigmented single ocellis on each side. Antennae half as long again as the head, ratio of segments = 6 : 10 : 10 : 20. Claws with two prominent basal wing-teeth. Empodial appendage with broad inner and narrower outer lamellae. Spathulate tibiotarsal hair well developed. Mucro bidentate with basal spine. Clothing of scales and the usual ciliated clavate hairs.

Localities.—Crawley, Western Australia, November, 1930 (D. C. S.); You Yang Mountains, Victoria, September, 1931 (J. W. R.); St. Ronan's Well, Western Australia, June, 1932 (G. E. N.).

Type in the South Australian Museum.

Remarks.—This species is parallel with *Sinella monoculata* Denis, the difference lying in the generic characters.

KEY TO THE AUSTRALIAN SPECIES OF PSEUDOSINELLA.

1.	Ocelli, 6 on each side.	2
	Ocelli fewer than 6 on each side.	3
2.	Species with dark band on abdomen III. Empodial appendage apically truncate.	*P. fasciata*, n. sp.
	Species without abdominal band. Empodial appendage apically pointed.	*P. duodecemoculata* Hndn.
3.	Ocelli absent. Mucro falciform.	*P. martelli* (Carp.).
	Ocelli present.	4
4.	Ocelli, 3 on each side.	*P. sexoculata* Schött.
	Ocelli, 2 on each side.	[1] *P. alba* (Pack.) Schffr.
	Ocelli, 1 on each side.	*P. unioculata*, n. sp.

Genus SIRA Lubbock, 1869.

Two species of this genus were described from Australia by Schött (226), namely, *Sira abrupta* and *S. tricincta*. There would seem to be some little doubt as to whether these are strictly members of this genus, but the species have not been rediscovered since they were first found.

SIRA PLATANI (Nicolet), 1841), f.p.

The above well-known European species was found in fair numbers under boards in a garden at Alberton, near Adelaide, South Australia, in March, 1934 (H. W.).

Handschin (127) has shown that the various European species of *Sira*—*S. platani* (Nic.), 1841; *S. flava* Agr., 1903; *S. nigromaculata* Lubb., 1870; and *S. corticalis* Carl., 1899—are all colour forms of the same species gradually increasing in the intensity of the abdominal bands until the almost black form *platani* is reached, and that as this form has priority the species should be known by that name.

The specimens from Alberton are somewhat intermediate between a dark *corticalis* and the typical *platani*.

Genus MESIRA Börner, 1903; Handschin, 1925; nec. Schtscherbakow, 1898.

MESIRA CALOLEPIS Börner, 1913.

Description.—Length, to 2·5 mm. Colour, in immature forms entirely yellowish, in adults with bluish pigment on side of thorax II., III., and abdomen I. with narrow bluish bands. Antennae three times as long as head, segment IV. weakly ringed and with apical sensory knob. Claws with three inner teeth and outer lateral tooth. Empodial appendage narrow with more or less truncate apex. Mucro bidentate with basal spine.

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[1] *P. alba* (Pack.) has not yet occurred in Australia, but as specimens have recently been seen from Auckland, New Zealand, it is included in the key.

This species was originally described by Börner and later redescribed by Handschin, both from material from Java. In Australia I took several specimens from under stones at Mullewa, Western Australia, in September, 1931.

MESIRA FLAVOCINCTA (Schött, 1917). (Text fig. 14, *a.-c.*)

= *Lepidocyrtoides flavocinctus* Schött, 1917.

Description.—Length, 2-5 mm. Antennae two-thirds as long as body; segment IV. ringed. Thorax II. comparatively slightly overhanging head and about twice as long as III. Abdomen IV. four times as long as III. Ocelli, 8 on each side, unequal. Tibiotarsal spur hair hardly as long as claw. Claw with four

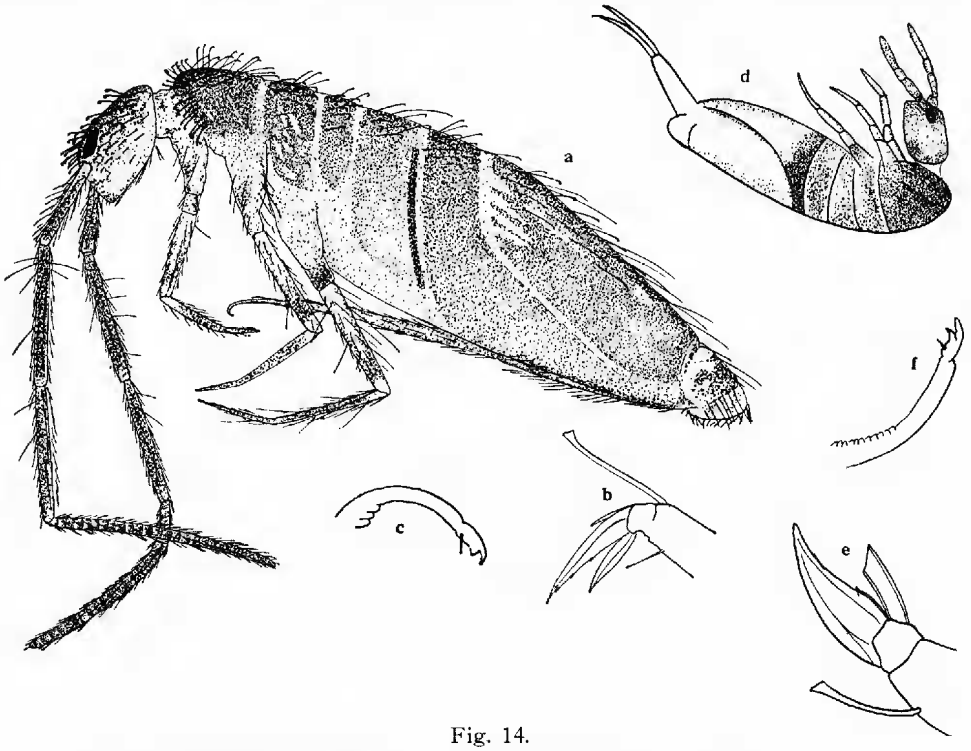

Fig. 14.

a. *Mesira flavocincta v. unicolor*, n. v. Entire animal.
b. „ „ „ „ „ Claw, empodial appendage, and tip of tibiotarsus.
c. „ „ „ „ „ Mucro and tip of dens.
d. *Lepidocyrtus nigrofasciata*, n. sp. Entire animal, without scales or hairs.
e. „ „ „ Claw, empodial appendage, and tip of tibiotarsus.
f. „ „ „ Mucro and tip of dens.

inner teeth. Empodial appendage pointed. Unringed portion of dens twice as long as mucro. Mucro bidentate with basal spine. Scales pointed or rounded with moderately long striations.

This is a common species in Western Australia, and I have seen specimens from Tasmania. The specimens nearest to the typical form as described by Schött have not the entirely white band on abdomen I. but also a little blue on this segment; the anterior part of abdomen IV. is also whitish. The majority of Western Australian specimens, however, are almost entirely blue-pigmented, except for a few light dorsal streaks. For this form I suggest the name **unicolor**, n. var.

Schött's figure shows the insect to have a characteristic convex curvature to the body. In most of my Western Australian specimens this is also the case, but in some the dorsal curvature is concave so that the mesonotum appears to be more overlapping the head than in the others. The appearance of the latter rather suggests the form of *Lepidocyrtoides,* and at first I was disposed to consider these as *Lepidocyrtoides cucularis* Schött.

Localities.—Picton Junction, Western Australia, October, 1930 (H. W.); Guildford, Western Australia, October, 1930 (H. W.); Wembley, Western Australia, November, 1930 (H. W.); Perth, Western Australia, November, 1930 (H. W.); Parkerville, Western Australia, October, 1930 (H. W.); Lesmurdie, Western Australia, October, 1930 (D. C. S.); Cascades, Tasmania, August, 1932 (V. V. H.).

MESIRA AUSTRALICA (Schött, 1917).

= *Lepidocyrtoides australicus* Schött, 1917.

Description.—Length, 3·5-5·0 mm. Colour, yellowish white, front of mesothorax and sides of body segments with bluish pigment, laterally on top of segments also with bluish stripes. Ocellar patches joined by a blue line between antennae. Antennae and appendages with bluish rings. Antennae two-thirds as long as body, IV. distinctly annulated and with terminal knob. Mesonotum only slightly overlapping head, twice as long as metanotum. Abdomen IV. from 4 to 6 times as long as III. Ocelli, 8 on each side, anterior pair large. Tibiotarsal spur hair shorter than claw. Claw with lateral tooth, proximal double tooth and two distal teeth. Unannulated portion of dens twice as long as mucro. Mucro bidentate with basal spine.

Localities.—Government House Lake, Rottnest Island, Western Australia, 1930 (L. J. G.); Belgrave, Victoria, 1931 (H. G. A. and H. F. D.); Sherbrook, Victoria, April, 1931 (H. G. A.); Morialta, Adelaide, South Australia, August, 1933 (H. W.); Victor Harbour, South Australia, January, 1934 (H. W.); Forest Hill, Queensland, December, 1932 (A. R. B.).

Remarks.—All the material that I have seen has been of the typical form as described by Schött. In his original description Schött does not mention the annulation of the IVth antennal segment. This is, however, in all my material very distinct and, therefore, the species is here placed in the genus *Mesira.*

Mesira fasciata, n. sp. (Text fig. 13, *j.-o.*)

Description.—Length, 3·0 mm. Colour, without scales, dirty yellow with black eye-patches, a black band posteriorly on abdomen II. and entirely on III., tip of V. and VI. dark, venter of abdomen, femur III. and tibiae dark blue, antennae III. and IV. bluish darker at bases and apex of III. Ocelli, 8 on each side. Antennae half as long as the body, ratio of segments = $1\frac{1}{8} : 2 : 2\frac{1}{3} : 4$, IV. annulated with apical knob, I. and II. scaled. Mesonotum slightly overhanging head, ratio of head: th. II. : III. : abd. I. : II. : III. : IV. : V. : VI. = $3\frac{1}{2} : 2\frac{3}{4} : 1\frac{3}{4} : 1 : 1 : 1 : 5\frac{1}{2} : 1\frac{1}{2} : 1$. On the posterior edge of head where it joins the mesonotum is a collar of small spines. Furca long, ratio of manubrium to mucrodens = $3\frac{1}{2} : 5\frac{1}{2}$, mucro bidentate with basal spine, about one-third as long as unannulated portion of dens. At apex of manubrium are a few long setae. Dentes scaled. Legs long, tibiae with false joint, claws strong with outer lateral tooth and three inner teeth, one basal and two distal, empodial appendage long and simple as figured. Spathulate tibiotarsal hair present. Body scaled, scales brownish, obtusely pointed with distinct short striations.

Locality.—In debris, Brisbane, Queensland, May, 1933 (A. R. B.).

Syntypes in South Australian Museum.

KEY TO THE AUSTRALIAN SPECIES OF MESIRA.

1. Antennae longer than the body. Colour, whitish. Claw long and narrow, with one basal tooth and one very distal tooth on inside. *M. longicornis* (Schött).[2]

   Antennae shorter than the body. 2

2. Species of a light yellowish colour, sometimes with bluish pigment laterally. *M. calolepis* Börner.

   Species almost entirely pigmented or with lateral longitudinal marks or with cross-bands. 3

3. Species with cross-band on abdomen II. and III. *M. fasciata*, n. sp.
   Species not as above. 4

4. Species almost entirely bluish pigmented with only light longitudinal streaks, sometimes abdomen I. entirely white. *M. flavocincta* (Schött).

   Species yellowish with bluish longitudinal markings laterally and dorsally. *M. australica* (Schött).

Genus LEPIDOCYRTUS Bourlet, 1839; Handschin, 1925.

Syn. = *Podura* Linne, 1767 (ad partem); *Poidium* Koch, 1840; *Cyphodeirus* Nicolet, 1841 (ad partem).

This genus in a strict sense is defined by Handschin, 1925 (17) as possessing hyaline scales without long striations or faint short markings, unarmed dentes, claws without wing-like basal teeth, unannulated antennae and bidentate mucro with basal spine. Schött, in his paper on the Australian forms, gives the absence of the terminal knob on the fourth antennal segment as also characteristic. Of this genus only the first two of the following species have been previously recorded from Australia.

LEPIDOCYRTUS PRAECISUS Schött, 1917.

Description.—Length, 1·0 mm. Colour, blue, antennae and legs blue, furca yellowish. Antennae slightly longer than the head. Claws long and narrow with only a proximal double tooth. Empodial appendage truncate apically.

Since Schött recorded this species from North Queensland specimens have been taken in sweepings at Urrbrae, South Australia, in October, 1929 (D. C. S.), and in the hot-house of Government House, Perth, Western Australia, in February, 1931. It has also been found in the You Yang Mountains, Victoria, in September, 1931 (J. W. R.).

LEPIDOCYRTUS RALUMENSIS Schäffer.

Description.—Length, 1·0 mm. Colour (in spirit, yellowish) in life said to be "snow white." Antennae bluish, slightly longer than head. Claws strong with two inner teeth and outer lateral tooth. Empodial appendage lanceolate, not apically truncate. Spathulate tibiotarsal hair short and fine.

Schött recorded this species from Queensland, and specimens have been received from Miss J. W. Raff taken in the You Yang Mountains, Victoria, in September, 1931.

LEPIDOCYRTUS CYANEUS Tullberg, 1871.

= *Lepidocyrtus purpureus* Lubbock, 1873; *L. violaceus* Lubbock, 1873; *L. assimilis* Reuter, 1890; *L. metallicus* MacGillivray, 1891; *L. elegantulus* Meinert, 1890; *L. anglicanus* Jackson, 1926.

Description.—Length, to 1·5 mm. Iridescent dark blue or violet. Claw with strong lateral tooth and two inner teeth. Empodial appendage lanceolate and simple.

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[2] In his paper of 1925 (29) Schött was uncertain of the correct position of his *Lepidocyrtoides longicornis*. The annulated antennae will, however, place it in the genus Mesira as understood here.

This European species is almost cosmopolitan in its distribution. It occurs commonly on cultivated ground around Perth, Western Australia, and around Adelaide, South Australia.

Lepidocyrtus nigrofasciatus, n. sp. (Text fig. 14, *d.-f.*)

Description.—Length, 0·9 mm. Colour, yellow with deep blue pigment on mesothorax, metathorax and first three abdominal segments. The basal segments of the legs, a patch between the antennae bases and the antennae light blue. Antennae as long as the head, ratio of segments = 12 : 15 : 15 : 26. Furca long, ratio of manubrium to mucrodens = 5 : 4. Body densely haired and scaled. Scales brownish but without striations or marks. Claws with lateral teeth only. Empodial appendage parallel-sided and apically truncate. Mucro normal with two teeth and basal spine.

Locality.—Kalorama, Mount Dandenong, Victoria, in June, 1932 (J. W. R.); Mount Osmond, June 6, 1934 (H. W.); Botanic Gardens, Adelaide, June, 1934 (H. W.).

Syntypes in the South Australian Museum.

Remarks.—This species is very closely related to *L. instratus* Handschin, from the Swiss National Park, but is specifically distinct in the presence of lateral teeth to the claws as well as in the greater extent of the pigmentation. The blue pigment is sometimes lighter on th. II. to abd. II., and in the specimens from the Botanic Gardens it is entirely absent, the insects being entirely yellow. To this form I give the name of var. **aureus,** v. n.

KEY TO THE AUSTRALIAN SPECIES OF LEPIDOCYRTUS.

1.	Empodial appendage truncate apically.	2
	Empodial appendage not apically truncate.	3
2.	Colour yellow with blue pigment on th. II., abd. I., II., and III. Sides of empodial appendage parallel.	Claw with lateral teeth. *L. nigrofasciatus,* n. sp.
	Entirely blue pigmented species. Empodial appendage with divergent sides.	*L. praecisus* Schött.
3.	Colour in life bluish iridescent.	*L. cyaneus* Tullberg.
	Colour in life snow-white.	*L. ralumensis* Schäffer.

Genus LEPIDOSIRA Schött, 1925.

Schött erected this genus in 1925 (29) for several species which in 1917 (28) he had included in his heterogeneous genus *Lepidocyrtoides.* He specially named *L. australicus, L. sagmarius, L. coeruleus,* and *L. cinctus,* as being species of *Lepidosira.* As type of his *Lepidocyrtoides* he retained *L. cucularis,* and also included his *L. striatus* from New Guinea. Of the remaining species he would not express any definite opinion of *L. longicornis, L. flavocinctus* and *L. angulatus* (misspelt *angustatus* in his 1925 paper). *L. spinosus* had already been transferred to a new genus *Acanthocyrtus* by Handschin (17). In this paper it is shown that *L. australicus* and *L. flavocintus* are properly included in the genus *Mesira,* and it is here suggested that from Schött's description and figures *L. longicornis* will also probably fall into the same genus.

In 1927 Schött again discussed the genus *Lepidocyrtus* and redefined it on characters quite the opposite to those of his original diagnosis. This inconsistency I have discussed elsewhere (34). The genus *Lepidocyrtoides,* as originally defined, with *L. cucularis* Schött as the genotype, can be separated from *Lepidosira* by the very much longer mesonotum, compared with the metanotum, and by this segment very much overlapping the head.

The only species of *Lepidosira* that I have been able to examine is the following:—

LEPIDOSIRA COERULEUS (Schött, 1917).

= *Lepidocyrtoides coeruleus* Schött, 1917.

Description.—General facies of *Sira*-type. Length, 2-3 mm. Colour generally blue with the lighter ground showing through as spots on thorax II. and abdomen III. Antennae lightly pigmented, twice as long as head, IV. with terminal sensory knob. Mesothorax slightly overhanging head, distinctly longer than metathorax. Abdomen IV. from $3\frac{1}{2}$ to 4 times as long as III. Ocelli, 8 on each side, the proximal clements smaller. Tibiotarsal spur hair shorter than claw. Claw with lateral tooth and four inner teeth, the proximal pair in middle of inner edge. Empodial appendage lanceolate. Dentes with lancet-like ciliated scales ventrally. Mucro bidentate with basal spine.

Localities.—Originally from Queensland, this species can now be recorded from Muresk, Western Australia, October, 1930 (H. W.); Armadale, Western Australia, June, 1932 (G. E. N.); Gooseberry Hill, Western Australia, June, 1932 (G. E. N.); Muresk, Western Australia, 1932 (H. G. A.).

Genus ACANTHOCYRTUS Handschin, 1925.

ACANTHOCYRTUS SPINOSUS (Schött, 1917). (Text fig. 15, *c*.)

= *Lepidocyrtoides spinosus* Schött, 1917.

Description.—Length, 3·0 mm. Colour entirely bluish-black, but in life often showing silvery cross-striations which vary and are apparently due to reflection. Antennae and furca light. Antennae two-thirds of body length, IV. with terminal knob. Mesothorax slightly overhanging head, twice as long as meso-

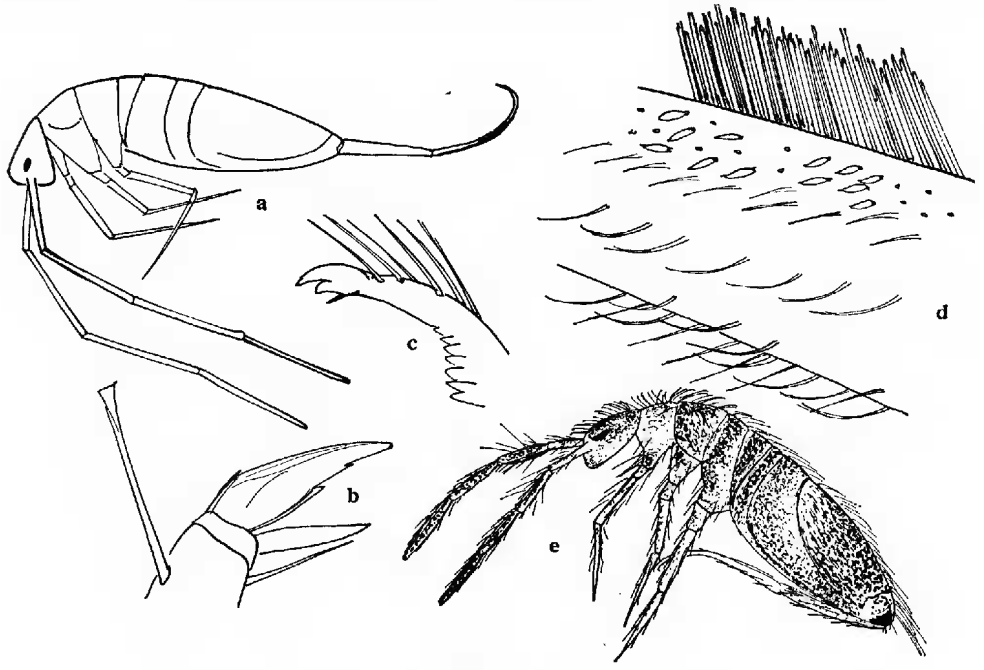

Fig. 15.

a.	*Acanthocyrtus lineatus*, n. sp.	Entire animal in outline.
b.	„ „ „	Claws, empodial appendage and tip of tibiotarsus.
c.	„ „ „	Mucro and tip of dens.
d.	„ „ „	Dental spines.
e.	*Acanthocyrtus spinosus* (Schött.)	Entire animal.

thorax. Abdomen IV. from two and a half to five times as long as III. Ocelli, 8 on each side, proximal smaller. Tibiotarsal spur hair shorter than claw. Claw with lateral tooth, proximal double teeth and one distal tooth. Empodial appendage lanceolate. Manubrium one-third longer than mucrodens. Dentes with many rows of spines and long setae. Long ciliated hairs on apical tergites of abdomen. Antennal segments with few pointed setae. Scales hyaline and striated.

Localities.—This species was first recorded by Schött from Queensland as *Lepidocyrtoides spinosus* and later placed by Handschin in a new genus *Acanthocyrtus* because of the distinctly spined dentes. It is very common and widely distributed in cultivated areas in the southern parts of both Western Australia and South Australia.

Acanthocyrtus lineatus, n. sp. (Text fig. 15, *a.-d.*)

Description.—Length, 4·0 mm. Ground colour yellowish with dark lateral stripes from head to base of abdomen IV., a few other markings laterally. Antennae dark, femora with a bluish-black subapical band, tibiotarsi with two bands, furca light. Antennae longer than body, ratio of segments = $2\frac{1}{2}$: $3\frac{3}{4}$: 3-$3\frac{1}{2}$: 5; IV. annulated with apical sensory knob. Ocelli, 8 on each side in two parallel rows on dark field. Ratio of th. II. : III. : abd. I. : II. : III. : IV. : V. : VI. = $3\frac{1}{2}$: $3\frac{1}{2}$: $2\frac{1}{3}$: $1\frac{1}{2}$: 2 : $1\frac{2}{3}$: 7 : 1 : $\frac{1}{2}$. Ratio of manubrium to dentes and mucro = 5 : 6 : 0·15; furca reaching ventral tube. Claws as figured. Dens with several rows of short stout spines and long ciliated setae. Mucro bidentate with basal spine, half the length of the unannulated portion of dens. Scales obtusely pointed, distinctly but not long striated.

Locality.—Among decaying leaves at Brisbane, Queensland, in September, 1932 (A. R. B.).

Syntypes in the South Australian Museum.

Remarks.—This species differs from the preceding in colour, length of antennae and other morphological details.

Subfamily PARONELLINAE Börner, 1906.

Genus PERICRYPTA Ritter, 1910.

This is a scaleless genus with a typical Paronelline mucro and closely allied to the genus *Salina* MacGillivray (= *Cremastocephalus* Schött). It differs in the structure of the mucro, the absence of the apical lobe of the dentes, the empodial appendage and the parallel arrangement of the ocelli. The body is humped generally and not locally as in *Campylothorax* Schött.

PERICRYPTA MJÖBERGI Schött, 1917.

Description.—Length, 2·0 mm. Colour, yellowish-white with deep blue markings as in Schött's figure. Antennae as long as body, ratio of segments = 1 : $1\frac{1}{2}$: $1\frac{1}{4}$: $1\frac{3}{4}$-2, antennae IV. with pointed sensory setae. Mesonotum a little longer than metanotum. Ratio of abdomen III. : IV. = 1 : $3\frac{3}{4}$-5. Ocelli, 8 on each side, proximal smaller. Tibiotarsal spur hair as long as claw, curved and spathulate. Claw with lateral teeth, double proximal tooth in the middle of inner edge and two distal inner teeth. Empodial appendage lanceolate. Mucrodens one and a half times as long a manubrium. Mucro with two teeth. Fine ciliated sensory setae on abdomen III. and IV.

Localities.—Originally described from Queensland, this species has been received from Adelaide, South Australia, in November, 1931, from under stones (D. C. S.); in moss, Cascades, Tasmania, in August, 1932 (V. V. H.).

Pericrypta dandenongensis, n. sp. (Text fig. 16, *a.-c.*)

Description.—Length, 1·3 mm. Colour, yellowish with blue-black pigment on metathorax; abdomen I., II. and III. dorsally. Base of antennae II. and III. also blue pigmented. The head between the ocelli and lightly on the middle of antennae I., II. and base of IV. reddish-brown. Antennae longer than body, ratio of segments = 16 : 26 : 20 : 35. Ratio of manubrium to mucrodens = 20 : 40, mucro with two teeth. Clothing of long clavate ciliated setae on dorsum and long pointed sensory setae on antennae. Claws as figured.

Locality.—A single specimen from Kalorama, Mount Dandenong, Victoria, in May, 1932 (J. W. R.).

Type in the South Australian Museum.

Pericrypta lineata, n. sp. (Text fig. 16, *d.-f.*)

Description.—Length, 4·5 mm. Colour, yellow, except for a small bluish spot between the ocellar fields, and an irregular bluish mid-dorsal line. Antennae long, I. and II. together three times as long as head (III. and IV. wanting). Ratio of

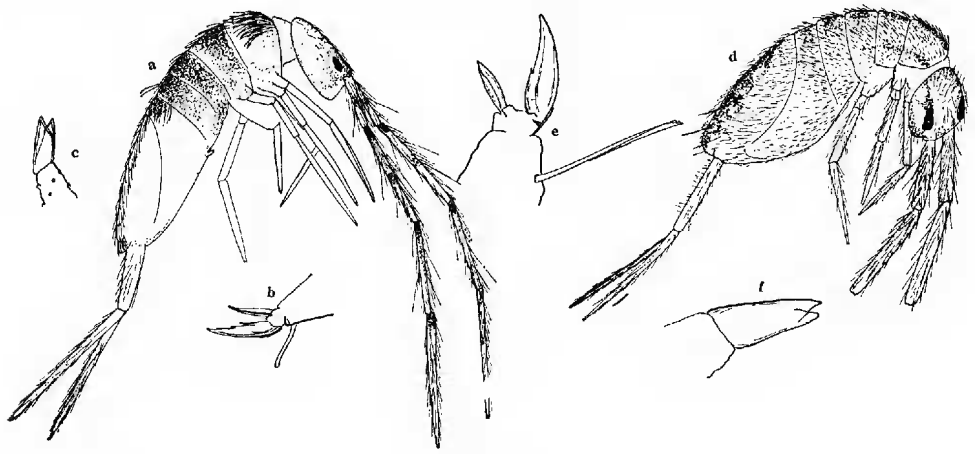

Fig. 16.

a. *Pericrypta dandenongensis,* n. sp. Entire animal.
b. „ „ „ Claw, empodial appendage and tip of tibiotarsus.
c. „ „ „ Mucro.
d. „ *lineata,* n. sp. Entire animal.
e. „ „ „ Claw, empodial appendage and tip of tibiotarsus.
f. „ „ „ Mucro.

antennal segments = 25 : 35 : ? : ?. Ocelli, 8 on each side. Claws strongly curved with two fine inner teeth, one before the middle, the other more distal; lateral teeth present but small, claw half as long again as the mucro. Empodial appendage simple, lanceolate. Furca long, ratio of manubrium to mucrodens = 3 : 4, mucro with two teeth. Clothing typical but with only a few strong abdominal setae.

Locality.—In moss, Trevallyn, Tasmania, in August, 1929 (V. V. H.).

Type in the South Australian Museum.

Remarks.—This species differs from the two preceding forms in the colour, dentition of the claws, and in the lack of strong setae on the abdominal segments, although it is possible that some of the last may have become lost.

Genus Pseudoparonella Handschin, 1921.

The old genus *Paronella* was very thoroughly revised by Handschin in 1921, so that the only two species hitherto known from Australia, *P. appendiculata* Schött and *P. queenslandica* Schött, must now be placed in *Pseudoparonella*. This genus is characterised by the mucro having only two teeth.

Pseudoparonella appendiculata (Schött, 1917).

= *Paronella appendiculata* Schött, 1917.

Description.—Colour, yellowish, with dark pigmentation on the sides and top of body. Antennae bluish. Mucro small. Claw with two distal inner teeth.

Locality.—Specimens referable to this species have been collected at Lesmurdie, Western Australia, in October, 1930 (D. C. S.).

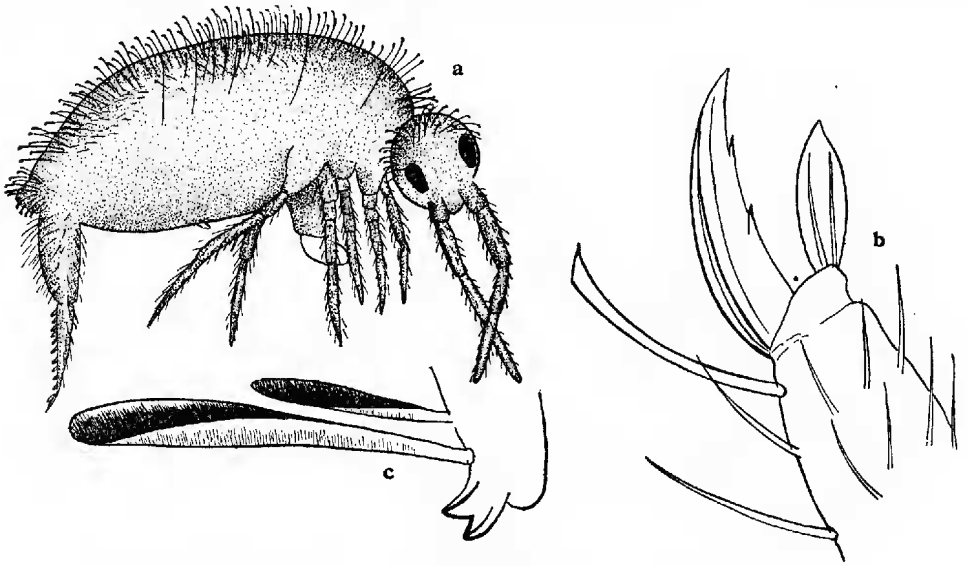

Fig. 17.

a. *Pseudoparonella halophila*, n. sp. Entire animal from side.
b. „ „ „ Hind foot.
c. „ „ „ Mucro and tip of dens.

Pseudoparonella halophila, n. sp. (Text fig. 17, *a.-c.*)

Description.—Length, 2·0 mm. Colour, whitish-yellow, except for the black ocellar patches and a black spot between the antennal bases. Antennae nearly three times the head length, ratio of segments = 10 : 16 : 13 : 22. III. and IV. bluish. Mesothorax one-third as long again as the metathorax. Furca long, reaching ventral tube, ratio of manubrium to mucrodens = 23 : 28, mucro with two teeth and one-third the length of hind claw. Claw with two prominent inner teeth. Ocelli, 8 on each side. Empodial appendage lanceolate with broad inner and outer lamellae.

Localities.—Type from Lake Herschel, Rottnest Island, Western Australia, in December, 1930 (L. J. G.); other specimens from amongst debris on shore of harbour at Albany, Western Australia, in October, 1930 (H. W.).

Remarks.—Differs from *appendiculata* Schött in the length of the antennae and the dentition of the claws, etc.

Type in the South Australian Museum.

Subfamily CYPHODERINAE Börner, 1906.

Genus CYPHODERUS Nicolet, 1841.

Syn. *Beckia* Tömösvary, 1882; *Boreus* Folsom, 1923.

CYPHODERUS SERRATUS Schött, 1917.

Description, 1·0-1·25 mm. Colour, white. Antennae one-third longer than the head, ratio of segments = 1 : $2\frac{1}{2}$: $1\frac{1}{2}$: $4\frac{1}{2}$, IV. with pointed sensory setae. Mesonotum slightly overhanging the head and distinctly longer than the metanotum. Abdomen IV. from 4 to 5 times as long as III. Ocelli absent. Postantennal organ absent. Claw with lateral teeth and three inner teeth, including the two proximal wing-teeth of different size, and a strong distal tooth. Empodial appendage with large outer wing-like tooth. Ratio of manubrium : dentes : mucro = 1 : 2 — $2\frac{1}{3}$: $2\frac{3}{4}$-4. Mucrones dorsally with a series of strong teeth, 9-13 in number. Large distal outer scale of dens reaching to $\frac{4}{5}$ of mucro.

This species was described by Schött from Queensland material. It occurs widely in both Western and South Australia and is associated with ants and termites.

CYPHODERUS BIDENTICULATUS Parona, 1888. (Text fig. 18, *a.-c.*)

Description.—Length, 1·6 mm. Colour, white. Ocelli absent. Antennae half as long again as the head, ratio of segments = $1\frac{1}{2}$: 3 : $1\frac{1}{2}$: 4. Claws with large and prominent unequal wing-like proximal inner teeth and one very indistinct distal tooth. Empodial appendage slightly over-reaching the larger basal tooth of claw and with the usual outer wing-like tooth. Furca nearly half as long as body, ratio of manubrium : dens : mucro = 7 : 4 : 2; mucro with two subapical teeth besides the apical one. Dens with a double row of 6-7 ciliated scales,

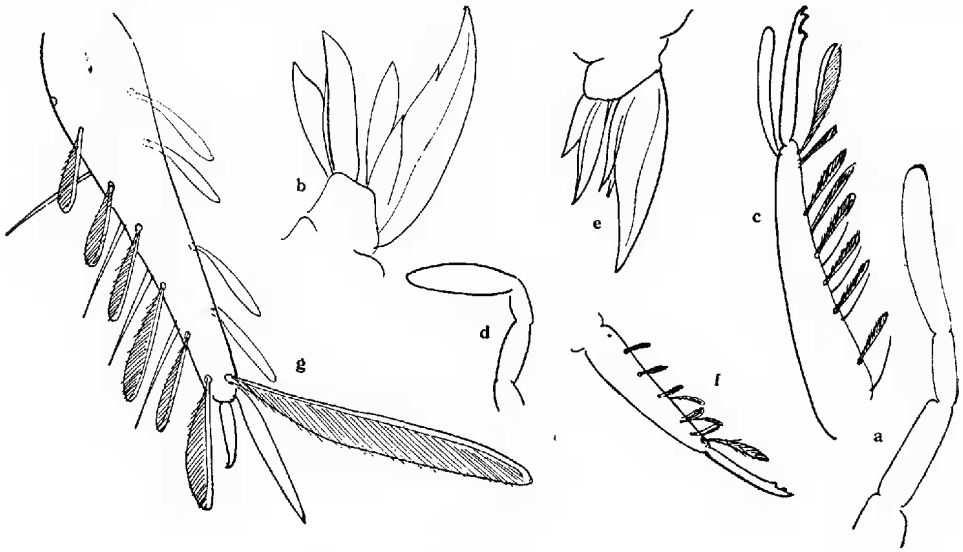

Fig. 18.

a.	*Cyphoderus*	*bidenticulatus* Paron.	Antenna.
b.	,,	,, ,,	Foot.
c.	,,	,, ,,	Mucro and dens.
d.	,,	*adelaideae*, n. sp.	Antennae.
e.	,,	,, ,,	Foot.
f.	,,	,, ,,	Mucro and dens.
g.	,,	*nicholsi*, n. sp.	Mucro and dens.

the apical outer scale almost reaching the tip of mucro, the inner one slightly shorter.

This species is known from Europe and Natal and is closely related to the European *C. albinos,* which has only one subapical tooth to the mucro.

Locality.—Glen Osmond, South Australia, 1933, in garden soil associated with ants.

Cyphoderus adelaideae, n. sp. (Text fig. 18, *d.-f.*)

Description.—Length, 1·4 mm. Colour, white. Ocelli absent. Antennae only slightly longer than the head, ratio of segments = 1 : 2 : 1 : 3. Claws with two strong inner basal teeth, practically equal and wing-like; no distal inner tooth? Empodial appendage normal, apically truncate and reaching beyond basal teeth of claw. Furca short and stumpy, one-third of body length, ratio of manubrium : dentes : mucro = 6 : 3 : $1\frac{1}{2}$, dens with two rows of ciliated scales, five on the inner row and only three larger ones on the outer row, apical outer scale reaching to proximal tooth of mucro. Mucro distinctly curved dorsally, with two subapical teeth besides the apical one.

Localities.—Burnside, South Australia, May, 1933, with termites (H. W.); Brown Hill Creek, South Australia, August, 1933, with termites (H. W.).

Syntypes in the South Australian Museum.

Remarks.—This species is rather closely related to the preceding but differs in the length and stoutness of the furca, the dental scales and the dentition of the claws.

Cyphoderus nichollsi, n. sp. (Text fig. 18 *g.*)

Description.—Length, 0·9 mm. Colour, yellowish-white. Ocelli absent. Antennae slightly longer than the head, ratio of segments = 1 : 3 : $1\frac{1}{2}$: 4. Claw with two prominent but slightly unequal inner basal teeth; distal inner teeth (?) Empodial appendage normal, not truncate apically. Furca short, ratio of manubrium : dentes : mucro = $3\frac{1}{2}$: 3 : $\frac{1}{2}$, dens with two rows of ciliated scales, 6-7 in each row and about equal in length in each row, the outer distal scale is five times as long as the mucro. Mucro very short and simple, without teeth other than the slightly upturned apex. Inner apical scale of dentes two and a half times the length of mucro.

Locality.—This species was found along with ants at Kalamunda, Western Australia, in June, 1932, by Prof. G. E. Nicholls, after whom it is named.

Type in the South Australian Museum.

Remarks.—Distinctly different from other species in the structure of the mucro.

KEY TO THE AUSTRALIAN SPECIES OF CYPHODERUS.

1. Mucro small, only one-fifth the length of dentes. Inner and outer scale at apex of dentes from $2\frac{1}{2}$-5 times as long as mucro. Mucro without teeth. *C. nichollsi,* n. sp.
   Mucro considerably larger. 2
2. Mucro with a series of from 9-13 strong teeth. Mucro about one-fifth longer than outer apical dental scale. *C. serratus* Schött.
   Mucro with only one or two subapical teeth. 3
3. Mucro fairly long and narrow with two small teeth, one subapical and one apical, somewhat S-shaped and slightly longer than the outer apical dental scale. *C. pseudalbinus* Schött.
   Mucro otherwise, with three teeth, two subapical and one apical. 4
4. Mucro dorsally curved. Dentes with inner row of five short ciliated scales and outer row of three larger scales. Outer distal scale of dentes not quite reaching the proximal tooth of mucro. Claw with two subequal inner basal teeth, no distal inner tooth. *C. adelaideae,* n. sp.

Mucro dorsally praetically straight. Dentes with two rows of 6-7 ciliated seales of equal length. Both inner and outer distal scales of dentes almost reaehing tip of mucro. Claw with two prominent but very unequal inner basal teeth and an indistinet inner distal tooth.

C. bidenticulatus Parona.

Key to the Superfamily Entomobryoidea (Collembola-Arthropleona).

A. Troehanteral organ, consisting of an area of fine hairs on hind eoxae, absent. Ventral edge of elaw without groove.

I. Abd. III. and IV. subequal, sometimes IV. slightly longer. With or without seales, if present then these entirely without longitudinal striae. Abdominal sensory hairs present or absent.

Family ISOTOMIDAE Sehäffer, 1896; Börner, 1903.

(a) Head hypognathus. Antennae inserted in middle of head. Tracheae present. Furcal segment with two stout ehitin ridges.

Subfamily ACTALETINAE Börner, 1906.
Single genus *Actaletes* Giard, 1889
(not Australian)

(a′) Head prognathus. No traeheal system. Antennae inserted in front half of head. Fureal segment without chitin ridges. Furea seldom absent. Postantennal organ mostly present.

(b) Scales present. Postantennal organ present, rosette like. Muero long with many teeth, without hairs.

Subfamily ONCOPODURINAE Börner, 1906.
Single genus *Oncopodura* Carl and Lebedinsky, 1905
(not Australian).

(b′) Scales absent. Postantennal organ when present simple. Mucro short.

Subfamily ISOTOMINAE (Sehäffer, 1898; Börner, 1913).

(c) Anus ventral, the opening being beneath or at least obliquely behind and beneath *(Folsomia)*, not terminal. Subapieal papillae of antennae present or absent. Genital and anal segments large. Dorsum smooth or granular. Anal spines present or absent.

Tribe Anurophorini Börner, 1905.

1. Anal spines present on abd. V. or VI. 2
   Anal spines absent. 4

2. Anal spines on abd. V. as a erown of 15-30, not on distinet papillae. Dens and mucro fused.

   Genus *Proctostephanus* Börner, 1906
   (not Australian).

   Anal spines on abd. VI. 3

3. Anal spines 2, small. Empodial appendage absent. Ocelli, 8 on eaeh side. Furca absent.

   Genus *Uzelia* Absolon, 1901.
   = *Pentapleotoma* Börner, 1903
   = *Protanurophorus* Womersley, 1926
   (not Australian).

   Anal spines 4, large. Empodial appendage present. Ocelli, 8 on eaeh side. Furca present or absent.

   Genus *Tetracanthella* Sehött, 1891
   (not Australian).

4. Furea present, even if partially reduced. 8
   Furea absent or only represented by papillae. 5

5. Furca represented by papillae. 6
   Furea entirely absent. 7

6. Integument honeyeombed. No clavate tibiotarsal hairs.

   Genus *Paranurophorus* Denis, 1928
   (not Australian).

   Integument very granular. Fureal papillae with two short chitinous salient edges. Empodial appendage and tibiotarsal elavate hairs present.

   Genus *Bornerella* Denis, 1925
   (not Australian).

7. Anal papilla present. Terminal knob on antennae IV. absent. Long in form, resembling *Folsomia*. Ocelli reduced.

Genus *Pseudanurophorus* Stach. (not Australian).

Anal papillae absent. Otherwise not as above.

Genus *Anurophorus* Nicolet, 1841 (not Australian).

8. Abd. VI. more or less concealed under V. or IV. to VI. fused. 9
Abd. with all segments distinctly visible from above and separated. Furca well developed and normal. Postantennal organ present. Ocelli, 6 on each side.

Genus *Astephanus* Denis, 1926 (not Australian).

9. Abd. VI. concealed under V. Genus Cryptopygus Willem, 1906.
Abd. IV. to VI. fused 10

10. Anus distinctly ventral. Ocelli absent. Body elongate. Furca short.

Genus Isotomodes Axelson, 1907.

Anus not distinctly ventral, almost terminal. Ocelli reduced or absent. 11

11. Mucro falciform. Ocelli and postantennal organ absent. Antennae IV. with 5-6 large sensory clubs or two broad sensory lobes.

Genus Folsomina Denis, 1931, inc. Denisia Folsom, 1932.

Mucro dentate. Postantennal organ present. Ant. IV. normal. Ocelli reduced or absent. Genus Folsomia Willem, 1902.

(c′) Anus terminal. Anal segment seldom fused to genital. Anal spines present or absent. Empodial appendage and furca usually present.

Tribe Isotomini Börner, 1913.

1. Body form elongate and cylindrical. Dens and mucro not separated. Mucro bidentate. Postantennal organ long and narrow. Ocelli present.

Genus *Folsomides* Stach, 1922 (not Australian).

Body form otherwise. 2

2. With fine sensory hairs (Bothriotricheae) on abdominal segments. 3
Without these. 8

3. Dentes with simple or serrated spines. 4
Dentes without spines. 5

4. Spines on dentes serrated. Genus **Acanthomurus,** n. gen.
Spines on dentes simple but on distinct papillae or tubercles.

Genus **Proisotomurus,** n. gen.

5. Build peculiar. Antennae III. and VI. elliptical and annulated. Ocelli, 6 on each side. Postantennal organ present. Mucro with 3 teeth. Trochanteral organ? Genus *Architomocerura* Denis, 1931 (not Australian).
Not as above. 6

6. Antennae III. normal, II. with 15-20 sensory rods. Claw outside with a pair of long filaments. Littoral species.

Genus Axelsonia Börner, 1907.
Antennae III. normal. 7

7. Mucro with 3 teeth, the proximal two as a pair side by side and basal. Femora III. with a pointed process.

Genus *Archisotoma* Linnaniemi 1912 (not Australian).

Mucro normal with 4 teeth. Femora III. normal.

Genus Isotomurus Börner, 1903.

8. Species with clavate ciliated hairs on thoracic and abdominal segments as in Entomobrya. Abd. IV. little or much longer than III. Postantennal organ absent. 9

Species without such clavate hairs. Abd. IV. only slightly longer than III. Postantennal organ present or absent. 10

9. Mucro bidentate. Abd. IV. never much longer than III. Tibiotarsus without clavate hairs. Genus *Corynothrix* Tullberg, 1872 (not Australian).

Mucro falciform. Abd. IV. three times as long as III. Tibiotarsus with three clavate hairs. Genus **Isotobrya**, n. gen.

10. With feathered but not clavate hairs on thoracic and abdominal segments. Without scales. 11
Not as above. 12

11. Dentes without spines. Abd. IV. with two very long dorsal hairs. Genus *Alloschaefferia* Börner, 1903. (not Australian).

Dentes spined. Abd. IV. without excessively long hairs. Mucro 4-toothed, indistinctly separated from dens. Genus *Tomocerura* Wahlgren, 1900. (not Australian).

12. Species strongly sexually dimorphic. Males always with more than long ciliated hairs on abdominal segments, which are not present in the female. 13

Species in males at most with long ciliated hairs on abdominal segments, which are not present in the females. 14

13. Male with lateral processes on abd. IV. Genus *Guthriella* Börner, 1906 (not Australian).

Male with long curved horns on head. Genus **Rhodesia**, n. gen.[3] for *Vertagopus minos* Den. (not Australian).

Male with chitinous spines on abd. V. 14

14. Species with 4 stout spines on papillae on abd. V. Genus Spinisotoma Stach., 1926

Species without anal spines. 15

15. Abd. IV. equal to or shorter than III. 17
Abd. IV. longer than III. 16

16. Tibiotarsus with a single broadly spathulate tenent hair. Genus *Pteronychella* Börner, 1909. (not Australian).

Not as above. Genus Proisotoma Börner, 1906.

† Abd. V. and VI. separated. Subgenus Proisotoma s. str. Börner, 1906.

‡ Abd. V. and VI. fused. Subgenus Isotomina Börner, 1903.

17. Claw with basal tunica. Mucro short, bidentate, with long setae overlapping it. Genus *Agrenia* Börner, 1906 (not Australian).

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[3] In his recent paper on the South African Collembola (34) the writer recorded *Isotoma (Vertagopus) minos* from Southern Rhodesia. This species, originally recorded by Denis from Italian Somaliland, was placed under *Vertagopus* by Denis because of the clavate tibiotarsal hairs. It differs remarkably, however, in the ornamented armature of the male sex, and the writer now proposes the generic name of *Rhodesia* for it. The specialized secondary horns and hairs of the male seem to justify this, as in the case of Börner's genus *Guthriella* erected for *Isotoma muskegis* Guthrie.

Claw without basal tunica. No seta overlapping mucro. Tibiotarsal clavate hairs present or not.

Genus Isotoma (Bourlet, 1839) Börner, 1906.

† Tibiotarsal clavate hairs present.

1. Abd. V. and VI fused. Furca reaching ventral tube. Mucro with three teeth. Subgenus *Pseudisotoma* Handschin, 1924 (not Australian).

2. Abd. V. and VI. free. Furca only reaching back edge or abdomen II. Mucro 4-toothed.

Subgenus *Vertagopus* Börner, 1906 (not Australian).

‡ Tibiotarsal clavate hairs absent. Furca reaching ventral tube.

Subgenus Isotoma s. str. Börner, 1906.

II. Abd. III. longer than IV., all tergites free. With or without scales, if present then with longitudinal ribs. Postantennal organ absent. Ciliated sensory setae present on abdominal segments or not. Furca present. Family TOMOCERIDAE (Schäffer, 1896).

(a) Dentes at least indistinctly annulated. Mucro small, unhaired. Antennae III. not greatly longer than IV. Subfamily LEPIDOPHORELLINAE Börner, 1906.

(b) Without scales. Mucro as in Isotomurus, small. Antennae III. and IV. and distal part of II. annulated. Dentes without spines.

Tribe **Neophorellini** n. tr.
Single genus *Neophorella* Womersley, 1933 (not Australian).

(b') Scales present. Mucro falciform. Antennae not annulated.

Tribe **Lepidophorellini** n. tr.
Single genus Lepidophorella Schäffer.

(a') Dentes not annulated, 2-segmented. Mucro long, haired. Antennae III. much longer than IV. Subfamily TOMOCERINAE Börner, 1906.

1. Ocelli present, 6 on each side. Tibiotarsal clavate hair present.

Genus *Tomocerus* Nicolet, 1841 (not Australian).

† Head of maxillae without beard. Subgenus Tomocerus s. str. Börner, 1908

‡ Head of maxillae with beard. Subgenus Pogonognathus Börner, 1906.

Ocelli and tibiotarsal clavate hair absent.

Genus *Tritomurus* Frauenfeld, 1854 (not Australian).

B. Trochanteral organ present on leg III. Ventral edge of claw generally with basal groove. Hairs and scales often ciliated. Abd. IV. as a rule longer than III. Furca present.

Family ENTOMOBRYIDAE Schäffer, 1896.

1. Dentes slender, annulated. Mucro small. With or without scales or ocelli.

Subfamily ENTOMOBRYINAE Börner, 1906.

(a) Antennae 4-segmented. Tribe Entomobryini Börner, 1906.

1. Body entirely without scales. 2
Body scaled. 5

2. Body strongly convex. Furca reaching to below the head. Mucro simple, not hook-like, not distinct from dens. Antennae much longer than body.

Genus Coelura Schött, 1917.

Body normal. Furca shorter, mucro distinct and normal. 3

3. Claws with wing-like basal tooth. Clavate tibiotarsal hair present but weak. Tibiotarsus inside with double row of naked setae.

Genus Sinella Brook, 1882.

Claws normal. Clavate tibiotarsal hair well developed. 4

4. Mucro falciform. — Genus DREPANURA Schött, 1896.
   Mucro dentate. — Genus ENTOMOBRYA Rondani, 1861.
   † Dentes spined. — Subgenus *Homidia* Börner, 1906 (not Australian).
   ‡ Dentes not spined. — Subgenus ENTOMOBRYA s. str. Börner, 1906.

5. Dentes spined. — 6
   Dentes not spined. — 8

6. Claw with basal wing-like tooth. — Genus *Metasinella* Denis, 1923 (not Australian).
   Claw normal. — 7

7. Dental spines in a single row. — Genus *Acanthurella* Börner, 1906 (not Australian).
   Dental spines in a multiple series. — Genus ACANTHOCYRTUS Handschin., 1925.

8. Dentes scaled. Body scales apically rounded, or if pointed then obtusely so. — 10
   Dentes not scaled. Scales of body acutely pointed apically, and with comparatively few long striations. — 9

9. Mesonotum overlapping head. Apical segment of abdomen with a finger-like process. Antennae longer than half the body. Mucro bidentate with basal spine. — Genus *Epimetrura* Schött, 1925. (not Australian).
   Mesonotum not overlapping head. Apical abdominal segment without finger. Antennae shorter. — Genus SIRA Lubbock, 1869.

10. Antennae III. and IV., or only IV., annulated. — 11
    Antennae not annulated. — 13

11. Mucro falciform. — Genus LEPIDOCYRTINUS Börner, 1903.
    Mucro dentate. — 12

12. Mesonotum very strongly overlapping head, about 4 times as long as metanotum. — Genus LEPIDOCYRTOIDES Schött, 1917.
    Mesonotum not so strongly overlapping head, only twice as long as metanotum. — Gen. MESIRA Börner, 1903; Handschin, 1925, nec. Schtscherbakow, 1898.

13. Claw with basal wing-like tooth. — 18
    Claw normal, without wing-like teeth. — 14

14. Scales hyaline, markings scarcely visible. Antennae IV. without retractile terminal organ. — 15
    Scales more chitinised, markings distinctly visible. Antennae with retractile organ at apex. — 17

15. Tibiotarsal clavate hair absent. Mucro bidentate, with 2 basal spines. Claw sickle-like. Empodial appendage with strong inner angle. — Genus *Trichogaster* Handschin, 1931 (not Australian).
    Not as above. — 16

16. Mucro bidentate with basal spine. — Genus LEPIDOCYRTUS Bourlet, 1839.
    Mucro falciform. — Genus *Drepanocyrtus* Handschin, 1925 (not Australian).

17. Mucro dentate. — Genus LEPIDOSIRA Schött, 1896
    Mucro falciform. — Genus PSEUDOSIRA Schött, 1896. = *Mesira* Schtscherbakow, 1898.

18. Empodial appendage also with wing-like tooth. — Genus *Lepidosinella* Handschin, 1919 (not Australian).
    Claw only with wing-like tooth. — 19

19. Basal wing-like tooth of claw single, scale-like. Genus *Sirodes* Schäffer, 1897. (not Australian).

With a pair of well-developed basal wing-like teeth to claw.

Genus PSEUDOSINELLA Schäffer, 1897.

(a′) Antennae 5 to 6 segmented, I. or II. subdivided (seldom 4-segmented, if so then IV. as long as body). Mucro bidentate with basal spine.

Tribe ORCHESELLINI, Börner, 1906.

1. Without scales. Antennae 6-segmented. Abd. IV. twice as long as III.

Genus *Orchesella* Templeton, 1835 (not Australian).

With scales. 2

2. Antennae 4-segmented, IV. thickly annulated and longer than body. Abd. IV. only a little longer than III. Genus *Typhlopodura* Absolon, 1900 (not Australian).

Antennae 5 to 6-segmented. Abd. IV. 3 to 8 times as long as III. 3

3. Apex of abdomen with a long articulate process.

Genus *Heteromuricus* Imms, 1912 (not Australian).

Without this process. 4

4. Antennae 5-segmented, IV. and V. or only IV. annulated. 5
Antennae 6-segmented, V. and VI. annulated Dentes spined.

Genus *Dicranocentrus* Schött, 1896 (not Australian).

5. Species without dental spines. 6
Species with spined dentes. Genus *Alloscopus* Börner, 1906 (not Australian).

6. Abd. IV. not more than 5 times as long as III.

Genus *Heteromurus* Wankle, 1861 (not Australian).

† Antennae V. annulated, Ocelli 2 or nil.

Subgenus *Heteromurus* s. str. Handschin, 1929.

‡ Antennae IV. and V. annulated. Ocelli absent.

Subgenus *Verhoeffiella* Absolon, 1900.

Abdomen IV. about 8 times as long as III. Antennae IV. not annulated. Thorax II. overhanging head. Genus *Strongylonotus* MacGillivray, 1894 (not Australian).

II. Dentes not annulated, not or only very slightly tapered apically.

(a) Dentes without fringed scales or setae dorsally, similarly haired dorsally or dorsolaterally. Dental spines present or absent. Empodial appendage with 4-winged edge. Mucro plump, separated or not from dens. With or without scales. In all known forms with ocelli and free living. Subfamily PARONELLINAE Börner, 1906.

1. Scales species. 4

Without scales. 2

2. Dentes distally, near base of mucrones with a scale-like appendage Antennae twice as long as body. Mucro bidentate. Genus SALINA MacGillivray, 1894.
= *Cremastocephalus* Schött, 1896.

Dentes without this appendage. 3

3. Mucro not distinctly separated from dentes. Antennae more than twice as long as body, and beneath with long, stiff setae, which are almost as long as segment. Mucro bidentate. Genus *Chaetoceras* Handschin, 1926 (not Australian).

Mucro separated, from dentes, with 2 teeth. Antennae not longer than body and without above setae. Body strongly convex longitudinally.

Genus PERICRYPTA (Ritter, 1910) Schött, 1917.

4. Body strongly humped in thoracic region. 5
   Body normal. 6
5. Hump most pronounced on mesothorax. Antennae 5-segmented. Mucro with 5 teeth. Genus *Idiomerus* Imms, 1912 (not Australian).

   Hump most pronounced on metathorax. Abd. IV. very long and basally bent almost at right angles with III. Dentes spined or not. Genus *Campylothorax* Schött, 1893 (not Australian).
6. Antennae half as long as body, I. and II. densely clothed with long black setae. Dentes spined. Mucro with 5 teeth. Genus *Dicranocentroides* Imms, 1912 (not Australian).

   Antennae normal. 7
7. Mucro with 2 to 4 teeth, small. Dentes spined. 8
   Mucro with 5 to 7 teeth. 10
8. Spines of dentes simple. 9
   Spines of dentes compound or serrated. Mucro indistinctly separated from the dens, with 3 teeth. Largest median tooth of dens upturned. Genus *Bromacanthus* Schött, 1925 (not Australian).
9. Mucro with only two teeth, often reduced to a stump. Genus PSEUDOPARONELLA Handschin, 1925.

   Mucro with 3 to 4 teeth, always well developed. Genus *Paronella* (Schött, 1893) Handschin, 1925 (not Australian).
10. Dentes with small blister or scale-like appendage apically. Genus *Microphysa* Handschin, 1925 (not Australian).

    Dentes without this appendage. Genus *Aphysa* Handschin, 1925 (not Australian).

(a') Dentes dorsally with ciliated or fringed scales or spines. Empodial appendage with 3-winged edge, or more or less reduced. Blind and scaled species. Subfamily CYPHODERINAE Börner, 1906.

(b) With an inner dorsal row of ciliated spines on dentes. Mucro at right angles to dens. Free living forms in caves. Tribe TROGLOPEDETINI Börner, 1906. Single genus *Troglopedetes* Absolon, 1907 (not Australian).

(b') With a double row of fringed scales on dentes. Termitophilous or myrmecophilous forms. Tribe CYPHODERINI Börner, 1913.

1. Mandibles with normal molar plate. 2
   Mandibles stylet-like, without molar plate. Body cylindrical. Mucrones claw-like. Clothing different in male and female. Genus *Calobatella* Börner, 1913 (not Australian).
2. Claw lobe-like with basal spine. Empodial appendage normal or rudimentary. Genus *Cyphoderodes* Silvestri, 1911 (not Australian).

   Claw of normal structure. Empodial appendage with wing-like tooth. 3
3. Head of normal prognathus form. Mandibles with well-developed molar plate. Dentes mostly with 5 inner and 6 outer dorsal scales. Genus CYPHODERUS Nicolet, 1841.

   Head hypognathus. Mandibles small with ornamented molar plate. Dentes only with 2 to 3 inner and 5 outer dorsal scales. Mucrones small. Antennae II. to V. with small curved sensory hairs. Genus *Pseudocyphoderus* Imms, 1912 (not Australian).

Selected Bibliography.

Owing to the necessity for economy of space, this bibliography only contains the papers actually cited in the text, together with a few of the more important and recent works. The latter will be found to contain very full lists of the literature on the Collembola.

The numbers quoted in Part I., Poduroidea, of this paper, published in these Proceedings, 1933, will necessarily be altered as follows:—29 (1), 35 (2), 38 (3), 44 (4), 68 (5), 82 (6), 84 (7), 158 (21), 168 (23), 177 (24), 198 (26), 226 (28), 238 (31), 241 (32), 265 (33).

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